The FOUNDRY

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Castings Rush Equipment To Scene of Fire

MUCH of the picturesque glamor of the fire alarm was lost when the modern motor driven truck replaced the horse drawn wagons. Present day equipment is the result of a gradual development which began with machines used by the Romans to throw water on fires. The oldest pumping engine of modern times, a hand operated affair, was made in Germany in 1656. The hand pumps, drawn by hand or by horses, were used in this country until the advent and general adoption of the steam fire engine. In all probability, the first steam operated fire engine was placed in service during 1829. Steam apparatus came into general use and only in recent years has it been supplanted by motor pumping equipment using gasoline engines. Introduction of motor driven equipment was a slow process, since those in charge of buying such equipment were undecided and required considerable evidence to prove that engines could be as reliable as the marvelously trained horses. In addition to the pumping trucks, the city fire department today is equipped with hook and ladder trucks, hose trucks, chemical trucks, water towers, and rescue squad trucks. Castings are used not only in the construction of the engines for fire equipment, but for many other parts of the truck.

Courtesy American-LaFrance and Foamite Corp.
Castings Are Used Extensively in the Manufacture of Various Types of Fire Trucks

Find Where Castings Can be Sold.

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Fig. 1—Molds Are Stacked on Skids Placed at an Angle to the Sides of the Building

EARLY in the history of Grand Rapids, Mich., in fact only five or six years after the first white settler established a store at the Indian village situated on the banks of the Grand River about 30 miles from Lake Michigan, the first cabinet maker arrived from Detroit and opened a small shop. Since the abundant supply of lumber from the heavily forested land of Northern Michigan was suitable for furniture, and cheap power was available from the falls in the river, it was only natural that more woodworkers should settle in the city, that small factories should be established, and that the industry should grow.

Today the city is recognized as one of the leaders among the communities of the country that produce quality furniture, some 15,000 designers and craftsmen being employed in its more than eighty furniture factories. However, other industries located within the city have spread the fame of Grand Rapids. The gypsum beds along the river valley furnish raw material for great quantities of plaster. The city boasts of the largest carpet sweeper factory in the world. Paper, textiles, refrigerators, show cases and many other products made in the city find a ready market throughout the country. Added to these, the city possesses one of the largest manufacturers of brass plumbing goods in the United States.

About 30 years ago, L. A. Cornelius, now president of the Wolverine Brass Works, started a small machine shop to manufacture brass plumbing goods. This shop was equipped with one or two lathes, and was operated entirely by Mr. Cornelius. He worked in the shop for a time making his product, and then called on a few customers to dispose of the manufactured articles. The business prospered from the first and soon one machinist and later more were employed. The first major expansion took place in 1912, when several of the buildings on the present site were built. Further expansion followed in 1918 and in 1923 additional floor space was provided for the rapidly increasing business.

Sells Direct to Plumbers

The company manufactures a complete line of brass plumbing fixtures and sells its product directly to plumbers. Sixty salesmen compose the sales force which represents the company in every state of the union. Since the company sells directly, an exceptionally large stock of finished materials must be kept on hand for quick shipment. Orders received in the morning mail are pushed through the routine of the office and are shipped the afternoon of the same day and orders arriv-

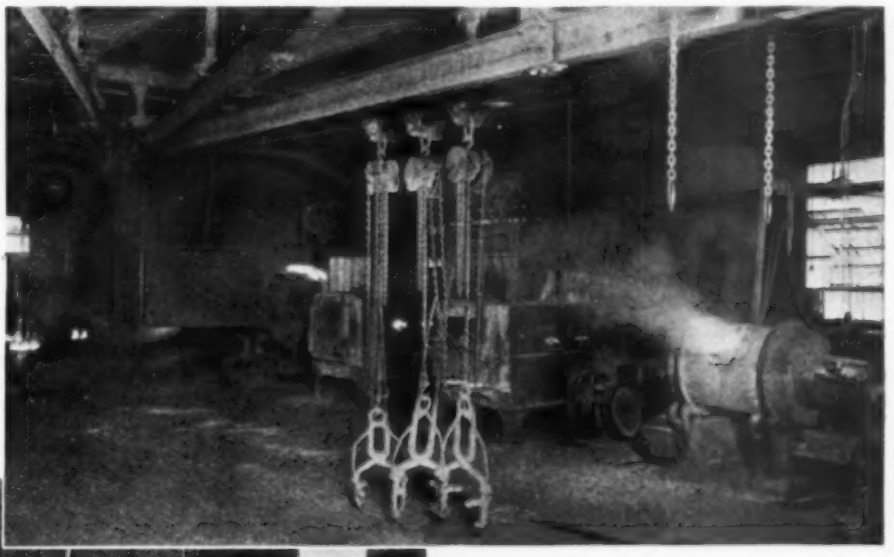
Michigan Brass Foundry *Specializes* in Plumbing Fixtures

ing in the afternoon are shipped before noon of the next day.

Line Is Diversified

The catalog of the company lists approximately 7000 items, of which about 5000 are made in the Wolverine plant. Many of these articles are made in large quantities on a production basis, since they represent the styles and types of fixtures and equipment which are in the greatest demand. It is from these lines that the bulk of the business is secured. On the other hand, many of the items listed in the catalog are made in small lots, since the demand is not heavy and they are carried in stock simply to complete the line. It may be seen that, due to this condition, parts of the manufacturing establishment may be engaged in production work, while the remainder is practically a jobbing shop producing small quantities. This situation is true in the foundry department. The building housing the melting and molding departments of the foundry was constructed in 1912. The cleaning department, coreroom, pattern storage and stock room are located in a portion of one of the buildings built in 1923. The systematic way in which the foundry is operated will permit a sizable increase in production without requiring additional space in the near future. To give a clear picture of the practice at this plant, the various departments and operations will be described in detail, beginning with the storage room for raw materials and following through the melting, cleaning and inspecting, with a side trip to the core department.

All raw materials received at the plant are un-



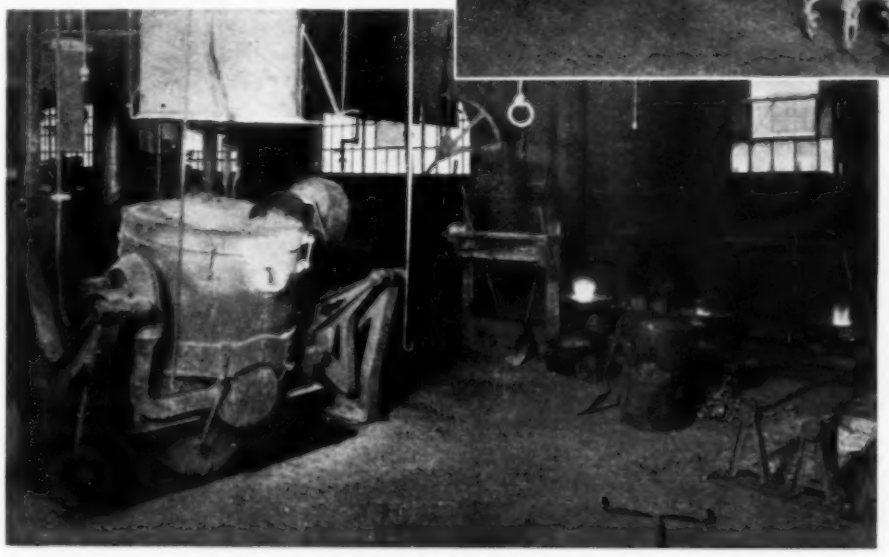


Fig. 2 (Left)—One of the Two Induction Type Electric Furnaces and Several of the Pit Type Melting Units. Fig. 3 (Above)—Open Flame Furnaces, Crucible Preheaters and Direct Arc Type Electric Furnace

loaded from the railroad cars directly into the basement of the building housing the cleaning department and the coreroom. This building is located at one end of the main molding bay while the melting department is at the opposite end of this bay. The sand is shoveled directly into any one of a row of bins built along the side of the room. The ingot metal is dropped from the cars into a chute which carries it to the basement level. The metal then is loaded on a scale truck, made by the National Scale Corp., Chicopee Falls, Mass., and is hauled to the nearby bins and piled. When metal is needed in the department which makes up the metal charges, the ingot is loaded on an electric industrial truck, carried to the foundry floor level on an elevator, and then transported to the melting department.

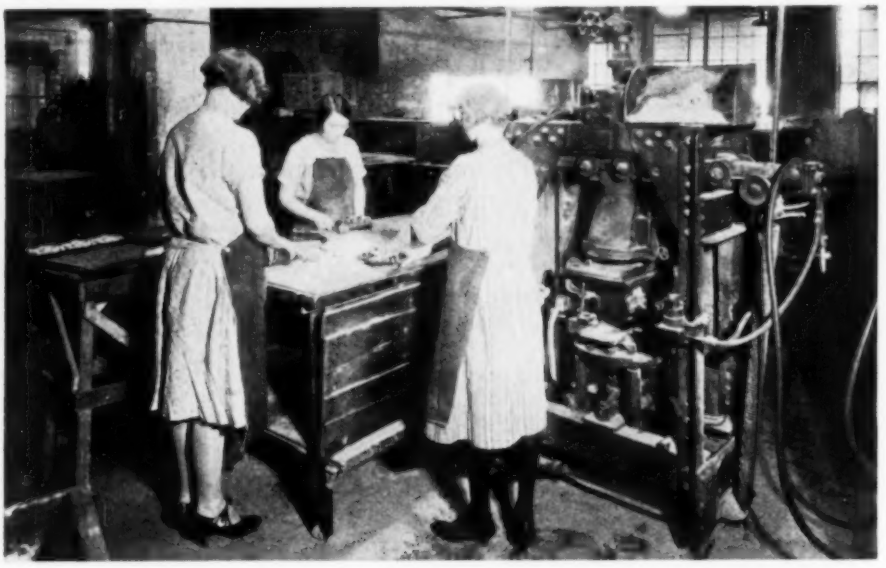


Fig. 4—Speed in Coremaking Is Secured by Using Three Operators to One Machine

All of the borings, turnings, punchings and other nonferrous scrap produced in the machine shop are remelted in the foundry. This scrap is taken from the machine shop to the foundry on a monorail carrier and then is hauled on electric trucks to the department where the metal mixtures are made. The borings and turnings first are run through a magnetic separator, which was built by the Dings Magnetic Separator Co., Milwaukee, and then are stored in bins according to analysis. The punchings and a certain amount of scrap copper wire produced in the plating department, are briquetted. Once a week the sweepings and skimmings are run through a concentrating machine. The heavy material resulting from this operation is added to the charges while the fine material is dried in an oven, riddled to eliminate the sand which may have been introduced into the mixture, and then used in preparing the charges for the furnace.

The management endeavors to remelt the borings, turnings and other scrap not later than the next day after the scrap enters the foundry. In other words, no stock of scrap remains on hand for any length of time. To accomplish this, considerable leeway is necessary in the various ingredients which may be used in making the different metal mixtures. As an example, a yellow brass having an analysis of 66.5 per cent copper, 30.5 per cent zinc, 2.5 per cent lead and 0.5 per cent tin may be considered. It is necessary that several mixtures be provided which will produce metal of the desired analysis, and will permit the use of the scrap on hand. One mixture may call for the use of red brass turnings, another for yellow brass turnings, another for clippings and punchings, etc., while the analysis of the metal after melting must be the same. Of course each change in the type of scrap used necessitates variations in the other metals used in the charge. The various mixtures used are shown on a large blackboard erected in the department where the charges are made.

Three men are employed in making ready the charges, running the borings and turnings through the separator, briquetting the clippings and punchings, and in reclaiming the metal in the sweepings and skimmings. These men weigh each charge carefully and take it to the furnace for which it was prepared. The larger furnaces which melt 1000 pounds receive their charges in steel barrels, while the charge for the smaller units weighs only 175 pounds and is made up in boxes.

At the present time, the foundry is melting approximately 28,000 pounds of metal daily. To accomplish this, a number of melting units are required. The melting equipment which is shown in Figs. 2 and 3, consists of two induction type, electric furnaces built by the Ajax Metal Co., Philadelphia; two open flame type furnaces supplied by the Monarch Engineering & Mfg. Co., Baltimore; one rocking, arc type, electric furnace built by the Detroit Electric Furnace Co., Detroit; and 6 oil fired, pit furnaces which have been rebuilt by the Wolverine company. The two crucible preheaters shown in the center of Fig. 3, were manufactured by the Bellevue Industrial Furnace Co., Detroit.

The charge for the induction type furnaces is made of brass turnings, rod turnings, clippings, and concentrate. About 1 hour and 20 minutes is required to melt a heat. The charge for the open-flame furnace consists of gates and ingots and occasionally 50 pounds of turnings are used. The charge is divided into 600 pounds of gates and return scrap and 400 pounds of ingot metal, while approximately 1 hour is required to melt a charge. The rocking-type furnace has a rated capacity of 350 pounds, although a charge of 380 pounds usually is used. This consists of 100 pounds of turnings, 100 pounds of returned scrap and 180 pounds of ingot. Fourteen heats of red brass may be melted in this furnace in a 9-hour day. The pit furnaces are charged with gates and ingot metal and 50 minutes is required to melt the heat.

While a number of different mixtures are used, the bulk of the castings are made from two red brass and two yellow brass mixtures. The analysis of one red brass is as follows: Copper, 85 per cent; zinc, 5 per cent; lead, 5 per cent and tin, 5 per cent. The second red brass is made up of 80.5 per cent copper, 11.5 per cent zinc, 5.5 per cent lead and 2.5 per cent tin. The analyses of the yellow brasses are as follows: Copper, 66.5 per cent; zinc, 30.5 per cent; lead, 2.5 per cent and tin, 0.5 per cent, and copper, 70 per cent; zinc, 25 per cent; tin, 2.5 per cent and lead 2.5 per cent. A mixture consisting of copper, 86 per cent; tin, 10 per cent, and zinc, 4 per cent is used in the manufacture of the patterns used in the shop and bearings for the machine shop are made of 80 per cent copper, 11 per cent lead and 9 per cent tin.

When a furnace is ready to pour, a crucible is taken from the preheater with tongs and is placed in the double ladle shank shown on the floor in Fig.

3. This crucible then is carried to the furnace and is filled with molten metal. After it is filled, the crucible is carried to the monorail line where a hoist conveyor, such as is shown in Fig. 3, is used to carry the crucible of metal to the foundry floor for pouring. A quadrant type hoist operating on a monorail is used to pull the crucibles from the pit furnaces.

One molding bay is located immediately beyond the melting department, while the second bay parallels the first. An excellent idea of the arrangement of one bay may be secured from Fig. 1. The photograph from which this illustration was reproduced was taken at the end of the foundry opposite the melting department, and the flare from one of the pit furnaces may be noted at the end of the gangway. The shop has 32 molding stations consisting of the molding machine and two pairs of skids. The molding machines are the squeezer type, built by the Arcade Mfg. Co., Freeport, Ill. All molds are made in cast-iron flasks which are 18 inches long, 12½ inches wide and 5 inches deep, and aluminum bottom boards are used as standard equipment. Patterns for the classes of production work are made of the bronze mixture previously described and are mounted on steel plates while the remainder of the patterns are supplied with follow boards.

The usual practice in molding is followed. The two halves of the flask are placed together with the pattern plate in the middle. With the cope on the bottom, the drag is filled with sand, struck off and the bottom board is set in place. The mold then is rolled over and the cope is filled with sand. A top band is placed on top of the cope and the sand is struck off even with the top of the band. A squeezer board is placed on top of the sand in the cope and the mold is squeezed. When the top band is removed after squeezing, the sand in the flask is level with the top of the cope. This feature makes it possible to stack the molds, a process which would be impossible if the sand in the flask was not level with the top of the cope.

After squeezing, the gate is cut, the cope is lifted off the pattern plate, the plate is drawn, the cores are set, and the mold closed. As shown in Fig. 1, the molds are stacked two high on skids placed at an angle to the gangway. By placing the skid in this position, it is possible to use a longer unit, and therefore provide facilities for handling more molds. The skid frame is 16 feet long, with one side built higher than the other. In this way the mold rests on the skid at an angle of about 30 degrees to the horizontal. The gate is at the high end so that the metal feeds down into the mold. By stacking the molds two high, approximately 48 molds may be placed on the two skids at one molding station.

Monorail equipment is used to transport the molten metal from the melting room to the various skids. This consists of a monorail track which extends the entire length of the gangway and a switch and monorail section passing over each skid. All molten metal is brought from the melting department by the molder's helpers. One helper brings down the metal, shakes out the sand and riddles the sand for several molders. The molder pours the metal with the aid of the helper.

Considerable care is exercised in controlling pouring temperatures. One man takes the temperature of every pot of metal as soon as it reaches the skid. The metal is cooled to a temperature of 2100 degrees Fahr. and then 3 ounces of phosphor copper is added to the 175 pounds of metal contained in the crucible. Any metal remaining in the crucible after pouring is poured into the pig molds, shown at the right in Fig. 2. After allowing sufficient time for cooling, the helper shakes out the molds, places the castings on lift truck skids, shown in Fig. 1, and riddles the sand through a gyratory type riddle built by the Great Western Mfg. Co., Leavenworth, Kans.

Before following the castings through the cleaning room to the machine shop, a short description of the core making department will be presented. That department is located on the second floor of the new manufacturing building situated at one end of the foundry. All of the core sand is mixed in a paddle-type mixer made by the Blystone Mfg. Co., Cambridge Springs, Pa., and located in the basement near the sand storage bins. All core sand is dried before it is prepared. The sand used includes fine bank sand, Lake Michigan sand and refuse sand from the foundry. Four different core sand mixtures are employed and both oil and dry binders are used.

While some of the cores are made at benches, the bulk of cores produced are made on three core blowing machines built by Wm. Demmler & Bros., Kewanee, Ill. The largest of the three machines operates at 120 pounds pressure and produces cores from a sand mixture made from refuse foundry sand. The other two machines, one of which is shown in Fig. 4, operate on an air pressure of 110 pounds. The air for the core machines is supplied by a compressor built by the Ingersoll-Rand Co., New York.

Fig. 5—After the Cores Are Baked in the Ovens, They Are Cooled in a Special Chamber

In practically every case where cores are made on the blowing machines, three operators and three corebox es are used. One does nothing but blow the cores. In some cases the second operator opens the box, and removes the core while the third brushes the corebox and closes it. In other cases the second and third operators both open the boxes and take out the cores, as is shown in Fig. 4, the machine operator alternating the boxes to the other two. A heavy production of cores may be secured by this procedure. On a core similar to the one shown in the process of manufacture in Fig. 4, three workers with one machine produced 7800 cores in 9 hours. Cast iron core boxes and cast iron dryers are used.

Cores are baked in a battery of

drawer-type ovens manufactured by the Foundry Equipment Co., Cleveland, and shown in Fig. 5. The ovens are oil fired and the temperature is maintained at approximately 350 degrees Fahr. An interesting method has been developed to cool the cores which are taken from the oven. A cooling compartment is provided as shown in Fig. 5, with two shelves to hold the trays filled with cores. Doors are built on both sides of the compartment so that the cores may be loaded into the cooler on one side of the compartment and removed on the other side. A blower is located at one end of the cooling compartment. Cold air is drawn from the outside of the building, is passed along the cores where it absorbs the heat, and is exhausted to the atmosphere. In addition to cooling the cores rapidly so that they may be used, this cooler also carries away the smoke and fumes usually arising from cores, immediately after they are removed from the core oven. The top of the dryer also is used as a table.

Transport Cores

Cores are smoothed and blackened and then are placed in trays for delivery to the molding floor. These trays are placed on a light buggy, which is lowered to the foundry floor on the freight elevator. A small, core rack is provided at one end of the foundry bay where several trays of the cores most used are kept in stock. In case the elevator breaks down or some other difficulty arises which temporarily prevents the steady flow of cores from the core room to the molding floor, cores may be used from the foundry storage. The main storage rack for cores is located at one end of the coreroom.

The cleaning room is located on the ground floor of the new manufacturing building, which also houses the coreroom. However, the floor level of the cleaning department is slightly higher than the molding floor, so that the castings are taken by industrial trucks to the elevator and raised to the higher level. Some time ago the company placed all of the sprue cutting operations on a piece work basis and succeeded in reducing the labor necessary for this operation. Where seven machines and a like number of operators formerly were required to accomplish this work, three men and three operators now keep up with the production schedule. A simple system is employed to record the amount of work completed by each operator of a sprue cutting machine. All of the castings made during the day are stacked on skids at each molding station, as shown in Fig. 1. If the production exceeds the capacity of one skid, two skids are used and the loaded unit is held at one end of the foundry. The foundry office has a record of the molds made during the day, so that by deducting the number not poured at closing time and adding the number remaining on the skids the evening before, the exact number of castings on the skid may be determined. By keeping a record of the various skids loaded with castings which are used by the various operators, it is possible to determine easily the amount of work done. The sprue cutting machines were manufactured by the Tessmer Machine & Tool Co., Detroit.

About 50 per cent of the castings produced are sandblasted in tilted type sandblast mills manufactured by the W. W. Sly Mfg. Co., Cleveland. The remainder of the castings are tumbled in any one of five water mills. All gates are tumbled in a larger mill to clean off the sand before remelting. After the sandblasting or tumbling process has been completed, the castings are dumped on tables and are sorted into metal containers. They then are passed a little further along to the grinding machines. All castings leaving the cleaning department are weighed on a scale built by the Toledo Scale Co., Toledo, O.

As previously mentioned, approximately 28,000 pounds of brass is poured daily while 13,000 pounds of castings are passed from the cleaning department to the machine shop. Over a period of time the foundry loss has averaged around 7 per cent while the loss due to leakage or other causes discovered in the machine shop or the plating department is 4.6 per cent.

An exceptionally well arranged pattern storage is located on the third floor of the manufacturing building, which also contains the cleaning room and the core department. Crucibles are stored in a compartment near the pattern storage, since the building is heated at all times. A portion of the third floor is devoted to shower baths, clothes racks, a kitchen and a dining room.

A forced draft system of ventilation is used throughout the foundry. Fresh air is drawn from the outside of the building by a large blower. Air passes through an exceptionally large radiator section, which in the winter months is heated with steam. This air is forced into the various parts of the foundry through large pipes, which may be noted above the tramrail system in Fig. 1. The air is forced into the room in such a volume that it carries the smoke and gas out of the building through large rotary ventilators located on the roof. Special ventilators are provided for several of the furnaces, as may be seen in Figs. 2 and 3. The ventilating system removes the smoke from the foundry in a remarkably short time and assures a plentiful supply of fresh air.

Keep Records

Complete records are kept of the work passing through the foundry and other manufacturing departments. When the order arrives at the foundry, it consists of a pad containing several different forms. The first form on this pad has a space for filling in the pattern number, the date, the order number, the piece number, the metal charged, the furnaces used, the pouring temperature and the molding station. This form is filled out as the work progresses through the foundry, and is removed from the pad when completed. The pad then accompanies the castings through the remaining operations where the proper information is entered on the proper form. When the castings have been carried through the cleaning department, the second form is filled out showing the condition of the castings and the loss. This is sent to the foundry superintendent for his information, and then to the central control board. As each one of these records reaches the central control board, it is filed so that it is possible to determine at once the exact location of any job in the plant. A form is made out and sent to the control board showing the loss due to leakage when the castings are tested after machining. A loss report also is sent to the control board showing the defects due to spongy metal.

The plant production manager also posts a card record in the foundry office showing the pattern number and piece number of all jobs ordered. A blue or a red ticket indicate whether the job is to be rushed or not. When the job leaves the foundry the card is returned to the production manager. All of the information collected by the man taking temperatures of the metal in the crucibles is entered upon records in the foundry office. Tests are made of the sand once a week and a record is kept of the results of these tests.

The foundry is under the direction of W. F. Herst, works manager. Fred Papke is the foundry superintendent and he is assisted by William Delk, melting room foreman; Charles Ottenwess, molding floor foreman; Dan Nagy, coreroom foreman; Leon Vanderlinde, cleaning room foreman and John Thompson, pattern foreman.

Many Processes Are Used To Produce High Grade Castings

By Edward E. Marbaker

THE electric furnace has had an important application in the production of cast iron made from steel scrap and in the melting of pig iron charges with large amounts of steel. This material, which has the characteristics of high test cast iron, may be made in the cupola, the open hearth furnace, or the electric furnace. Many of the details of the melting of charges containing high percentages of steel in the cupola have been worked out in Germany. In this country, the work of McLain has been of outstanding importance, and most foundrymen are familiar with it. The manufacture of semisteel or synthetic cast iron, as the product is called, in the open-hearth furnace is expensive, and has been used only for special purposes.

In some localities, and under certain market conditions, the electric furnace has proved to be most satisfactory either for direct production, or in combination with cupola melting, the latter process being known as duplexing. This process was developed in this country by Elliott and in Germany by Kerpely. Generally, however, melting in the electric furnace has been found to be more expensive than cupola melting, and it is not used to a great extent except for the manufacture of special cast iron. Williams and Sims, bureau of mines, Technical paper No. 418, have covered thoroughly the subject of electric furnace melting, especially in reference to American practice. They also have carried on considerable experimental work to demonstrate the value of this method in comparison with cupola melting.

That electric furnace cast iron possesses superior strength as compared with cupola iron of the same composition has been demonstrated by many investigators during recent years. For instance, Elliott, *Transactions*, American Electrochemical Society, 1919, stated that the breaking strength of standard bars was 2950 pounds with a deflection of 0.10 inch for cupola iron and 4400 pounds with a deflection of 0.115 inch for electric furnace metal.

Increased strength is due to the deoxidation and degasification of the iron, and the removal of non-metallic inclusions. As explained earlier, the amount of graphite, the size of the particles, and their distribution have a most important bearing on the physical properties. Cast iron melted in the electric furnace, possesses a structure of finer grain than cupola iron. This is due partly to the absence of gases, but to a greater extent to the fact that the iron is superheated during the melting process, and that all the carbon present has been dissolved to form a homogeneous liquid melt. From this solution, the graphite separates in minute particles when the melt begins to cool after pouring.

Describes Methods

IN THIS second part of a series of three by the author, the essential features of several methods for producing high quality cast iron are given. These include the electric furnace and the duplex process, the Wuest process and the Corsalli process. The third and concluding part will appear in an early issue.

Table I

Analysis and Properties of Electric Furnace Cast Iron

Heat No.	Total carbon, per cent	Silicon per cent	Manganese per cent	Phosphorus per cent	Sulphur per cent	Transverse strength,[1] lb. per sq. in.	Modulus of rupture lb. per sq. in.	Deflection, inches
296	3.24	2.13	0.60	0.58	0.065	4,440	69,250	0.185
282	2.97	2.10	0.57	0.54	0.069	4,680	73,000	0.175
534	3.23	2.47	0.76	0.69	0.025	4,250	66,300	0.222
537	3.16	2.45	0.70	0.16	0.024	4,350	67,900	0.200
554	3.01	2.00	0.56	0.14	0.026	4,680	73,100	0.183
Average	3.12	2.23	0.64	0.42	0.042	4,480	69,900	0.19

[1]A. S. T. M. Standard Bar.

Table II

Cast Iron Made by Duplexing

Cupola Melts						Same After Duplexing					
Total Carbon per cent	Silicon per cent	Manganese per cent	Phosphorus per cent	Sulphur per cent	Transverse Strength	Total Carbon per cent	Silicon per cent	Manganese per cent	Phosphorus per cent	Sulphur per cent	Transverse Strength
3.48	1.92	0.56	0.53	0.099	2,812	3.38	1.82	0.61	0.51	0.022	4,118
3.50	1.79	0.54	0.62	0.158	2,770	3.22	1.94+	0.54	0.61	0.052	3,985
3.35	1.91	0.72	0.59	0.091	3,748	3.26	1.77	0.73	0.58	0.018	5,096
3.40	1.94	0.42	0.58	0.069	3,602	3.41	2.21+	0.44	0.56	0.026	4,212
3.45	1.83	0.34	0.48	0.112	3,316	3.38	2.30+	0.36	0.47	0.033	4,022
Avg. 3.44	1.68	0.32	0.56	0.106	3,250	Avg. 3.33	2.01	0.54	0.55	0.030	4,287

+Silicon added in ladle.

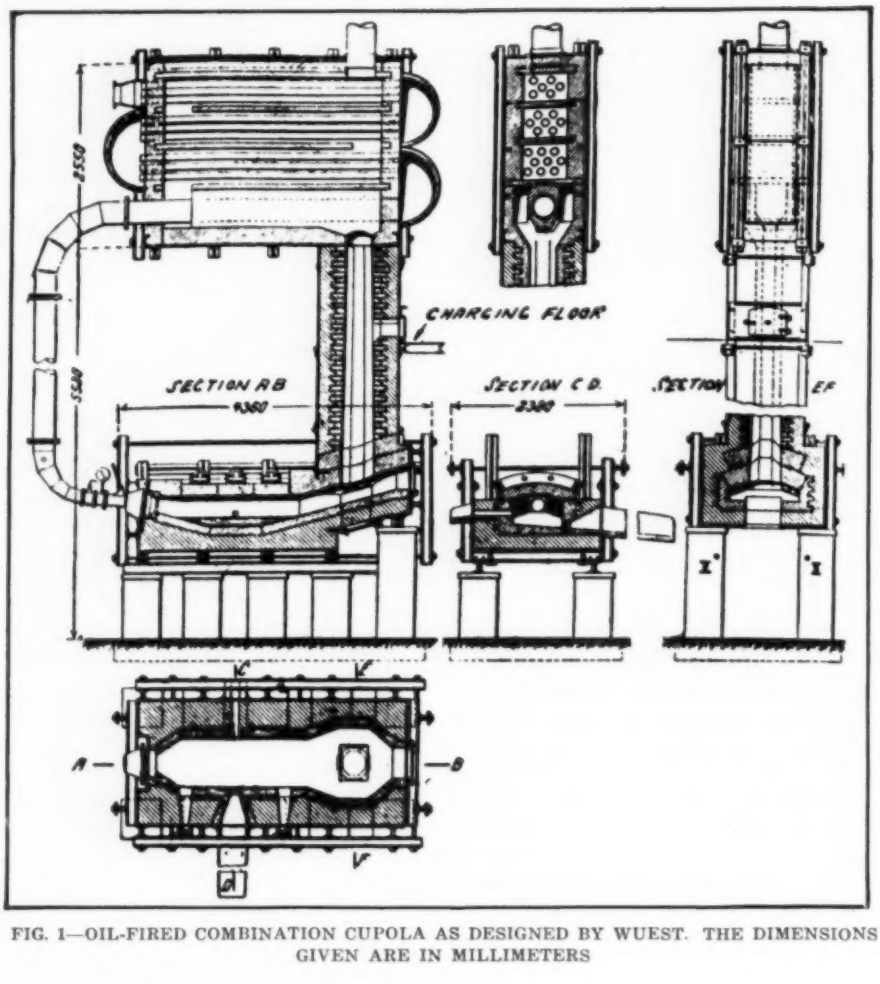


FIG. 1—OIL-FIRED COMBINATION CUPOLA AS DESIGNED BY WUEST. THE DIMENSIONS GIVEN ARE IN MILLIMETERS

Usually, in melting cast iron in the electric furnace, large amounts of steel scrap of low grade are used because of the low cost of such material. The carbon content is low, and artificial carburization by the addition to the melt of highly carbonaceous material must be resorted to. Ferromanganese and ferrosilicon must be used to bring the metal to the desired analysis.

Advantages of electric furnace melting are the possibility of using cheap raw materials, accurate control because the heat can be analyzed before pouring, and high temperature. Disadvantages are the high cost of installation and operation, except in localities where cheap power is available, and the necessity for intermittent operation. Losses due to intermittent operation have been eliminated in some plants by using the same furnace for both cast iron and steel melts.

Cupola melting of steel charges permits the absorption of carbon from the fuel coke, and unfortunately, this is often difficult to control. Ferrosilicon and ferromanganese are subject to high losses by oxidation when melted with the charge, and when added to the ladle, their action may not be efficient because of the lower temperature and the difficulty of thorough mixing. Therefore, the process generally is considered to be more satisfactory for the production of white cast iron than of gray. However, in most foundries, steel scrap in amounts up to 20 per cent is added regularly to the pig iron and scrap charge so that some advantage may be gained from the lower carbon content of the metal thus produced.

To melt high steel charges satisfactorily in the cupola, the furnace must be large, and the coke consumption higher than when producing gray iron from pig iron and scrap alone. The melting ratio is therefore lower. There is also danger of oxidizing the ferroalloys which are added to the charge. These conditions are brought about by the need of a high temperature for melting the charge. However, the superheating to which the metal is thus subjected, is undoubtedly one of the reasons for the improvement of its physical properties.

Undoubtedly the most satisfactory and economical method of making synthetic or high test cast iron is to melt the charge in the cupola and reheat and refine the metal in an electric furnace. Thus the latter acts as a forehearth, and adjustments of the carbon, silicon, and manganese contents may be made conveniently. Desulphurization and deoxidation may be carried out efficiently and if it is desirable, a high degree of superheat can be attained. Kerpely, *Giesserei Zeitung*, 1926 and 1928, describes gray cast iron made by this method which had the following analysis:

Element	Per Cent
Total carbon	3.05-3.10
Silicon	1.90
Manganese	0.93
Phosphorus	0.64
Sulphur	0.08

The tensile strength was 62,700 pounds per square inch and the elongation was 1.10 per cent. The graphite particles were finer than temper carbon, the ground mass was sorbitic rather than pearlitic, and little ferrite was present. The melting temperature was 3000 degrees Fahr. The metal was poured extremely hot and cooled normally.

In Table I is shown the results of melting an ordinary pig iron charge with 20 per cent steel scrap in the electric furnace according to Williams and Terry, *Transactions*, American Electrochemical Society, 1922. The effect of duplexing as reported by Elliott, *Transactions*, American Elec-

Table III

Cast Iron Made in the Wuest Furnace

Total carbon per cent	Silicon per cent	Manganese per cent	Phosphorus per cent	Sulphur per cent	Modulus of rupture lb. per sq. in.	Tensile strength lb. per sq. in.	Brinell hardness
3.06	2.04	0.83	0.36	0.021	62,700	35,800	225
3.31	2.40	0.76	0.46	0.055	53,800	31,400	195
2.70	1.66	0.90	0.42	0.077	78,500	47,000	215
2.70	1.67	0.96	0.39	0.074	78,500	42,500	235

tro chemical society, 1919, is shown in Table II.

The Wuest oil-fired furnace was described first in 1925 as the result of many years of investigation of the problem employing oil as a fuel in melting iron. Other inventors had designed and had patented furnaces for this purpose, but the Wuest furnace was the first practical adaptation of the idea. At least it is the first of which any elaborate report has been made. Klingenstein, *Stahl und Eisen*, 1925, describes the furnace as consisting of a combination of the ordinary cupola stack with a reverberatory hearth resembling an air furnace. The charge is introduced into the shaft in the usual manner from a charging floor, but no coke is used. One to two per cent limestone is added with the charge as a flux. The oil burner is placed at one end of the hearth and the charging shaft at the other and the flame sweeps across the bath and impinges against the column of charge in the shaft. Iron melts and runs into the hearth from which it is tapped, while fresh charges are added from above, or delivered through the throat. Slag is drawn off on the side opposite the tap hole. The blast is preheated by passing through a heat interchanger, placed above the furnace, to a temperature of 750 degrees Fahr. Fuel is a coal tar oil which has a heating value of 16,500 B.t.u. per pound. In a furnace capable of melting one ton an hour, the total oil consumption is about 250 pounds; in preheating the hearth for a half-hour 45 pounds of fuel is used. The temperature of the iron at the tapping spout is 2730-2900 degrees Fahr.

Obtain Low Carbon

Improvement of the quality of gray cast iron melted by this method, apart from the low sulphur content, consists in the finer graphite separation and in the possibility of obtaining with accuracy a uniformly low carbon content of the particular analysis desired. Graphite is separated in the fine granular form, rather than in the more usual form of lamallae. It is obvious that this form of graphite which has a profound effect in increasing the strength of the iron, is due to the high melting temperature. Results of four runs made in the foundries of the Esslingen Maschinenfabrik, as reported by Klingenstein, are shown in Table III.

Because of the scarcity of satisfactory raw material during the war, Corsalli attempted to melt charges of iron and steel refuse, such as borings and turnings, in the standard cupola. He advocated the use of briquetted materials. This led him to the idea of adding the ferroalloys, used in refining the iron, in the form of briquets to which a protective coating had been applied. This prevented the premature oxidation of the silicon and manganese. Corsalli also used coke which had been treated with milk of lime. This prevented the coke from burning until it reached the melting zone and it also decreased the rate of combustion in that part of the furnace. It was found that the carbon absorption was diminished. Corsalli then increased the blast volume materially. Gilles, *Giesserei-Zeitung*, 1926, in describing this work says, "He forsook the old rules of cupola practice and arrived at an entirely new method of procedure."

Foundrymen have been loath to increase the blast volume because of the resulting tendency toward oxidation of the iron, and the high losses of silicon and manganese by burning out. This increases the cost of the melting operation and endangers the quality of the product. However, Corsalli felt that if he could overcome this disadvantage, he would be able to increase the melting efficiency, and raise the temperature of the molten iron by greatly increasing the blast volume.

Decreases Carbonization

A method was developed finally by which these difficulties were said to be overcome largely. The charge consists of two-thirds steel or iron scrap, and one-third iron scrap consisting of runners and other waste material from previous pourings. The blast volume is increased 1½ to 2 times that ordinarily used and free oxygen up to one or two per cent may be added. Silicon up to 1 per cent is added as ferrosilicon, and the further required silicon and manganese are added in the molten condition from a special melting apparatus attached to the cupola and heated by the gases therefrom. By adding the ferroalloys in this way, the oxidizing zone in the shaft is avoided, and the high loss of silicon and manganese is more than half compensated. The total loss of silicon is 15-20 per cent and of manganese 10-15 per cent. The quantities of coke and limestone used are about the same as in ordinary cupola practice. Coke of good quality and large size, previously coated with lime, is used. The lime coating is said to decrease the activity of the coke.

The most important and significant result of the sharp blast is the decrease of the carbon absorption by the metal. It appears that the drops of iron trickling down do not carbonize because of the increased oxygen concentration, and because of the relative inactivity of the coke which is due to the coating of lime. It also may be assumed that carbon already present in the iron drops will be oxidized by the heavy blast. Such a strong blast, under ordinary conditions, would heat up the entire stack, and poor metal would be produced. Such a condition is prevented in this case by the inert nature of the coke. This also is claimed to prevent the reduction of carbon dioxide by the carbon, a reaction which takes place normally, and results in the production of carbon monoxide and a loss of heat. The exhaust gases have an average temperature of 250 degrees Cent. (480 degrees Fahr.).

Quality of the metal is that which might be expected of a low carbon content, and a uniform grain structure throughout in which the graphite appears in fine particles. The structure consists of ferrite and pearlite with well distributed, finely divided graphite. The structure does not vary materially with thickness of section.

The temperature of Corsalli iron at the spout is 2700-2750 degrees Fahr.; naturally it is poured hotter than ordinary iron because of the lower carbon content. For thin sections, the addition of ferrophosphorus to bring the phosphorus content to 0.5-0.6 per cent, and desulphurization are recommended.

Corsalli's process may be used in the production of malleable iron, as well as for gray cast iron, because of the low carbon content and the fine graphite present. It has been shown that a 24-hour heat treatment is sufficient to render the product malleable and ductile. The Corsalli process has the advantage of lower cost because, while the melting ratio of malleable iron in the air furnace is usually 2½ to 1, in this process, the ratio is 10 to 1.

Appointed Manager

W. B. Marshall has been appointed sales manager of the contract engineering department of the Chain Belt Co., Milwaukee. He has been associated with the company since 1921 when he was graduated from the Sheffield Scientific school of Yale university. He entered its employ as a student apprentice and after several years' work in the shops and foundries was made secretary to the general manager and later spent some time in the Chicago office. In 1926 he returned to Milwaukee and was engaged in contract sales engineering work until his recent appointment.

Speeds Core Baking

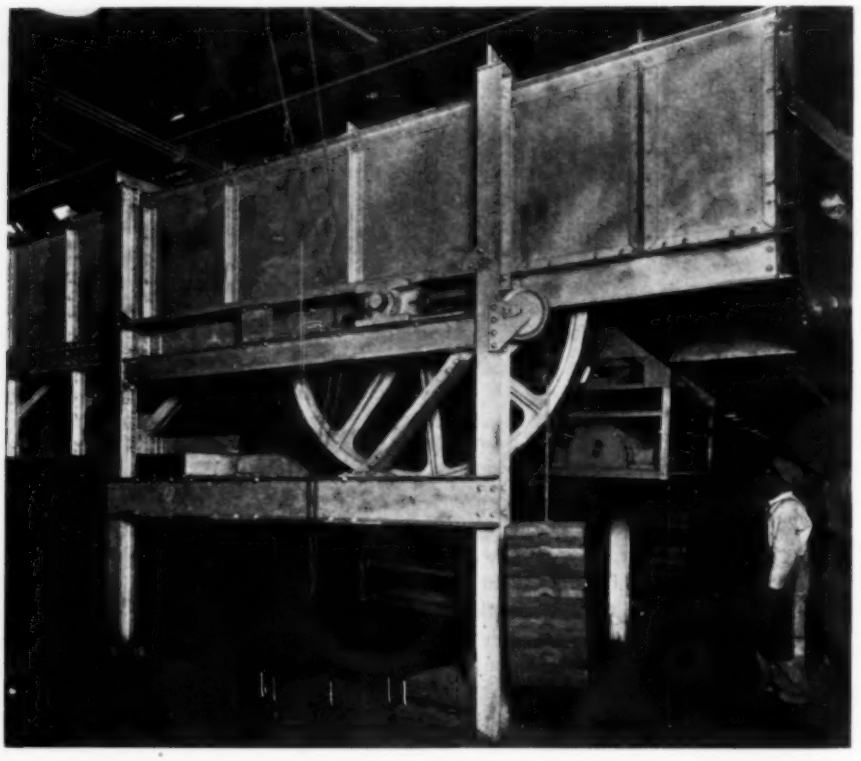


Fig. 1—The Racks Are Carried on the Chain, Over the Large Sprocket Wheel to Within Easy Reach of the Man Who Unloads the Trays

The 60-foot Cooling Chamber Is Utilized to Remove Practically All of the Heat from the Cores So That They May Be Handled Easily

with Continuous Type Oven

By Frank G. Steinebach

BEFORE the Packard Motor Car Co., Detroit, recently installed a continuous type core oven, all cores were dried in a battery of coke-fired, rack-type core ovens. Cores made at the various benches and on machines were loaded on racks, similar to those shown in the background of Figs. 3 and 4. Each rack was picked up by an electric lift truck and deposited in an oven where the cores were baked. Later the truck lifted each rack of dried cores and carried it to the pasting and blacking department shown in Fig. 3. At present many of the cores are baked in the continuous type oven. Future plans call for the installation of two additional units and the complete elimination of the coke fired, rack type ovens.

The large continuous type core oven recently placed in operation, was designed by H. M. Lane, and built by Holcroft & Co., Detroit. A general idea of the size of the installation may be secured from a study of Figs. 1 and 2, although the top of the heating compartment of the unit extends a considerable distance above the roof of the building and is not shown. Groups of core bin sections on both sides of the oven also prevented a single photograph showing the entire unit. The oven approximately 100 feet long and 40 feet high at the baking compartment shown at the left in Fig. 2 is of the double vertical lift type. The core rack is raised and lowered the full height of the baking chamber twice during the baking process. Entering the baking zone the core rack first is carried vertically to the top of the baking compartment, where the chain passes over a sprocket wheel, similar to that shown in Fig. 1. The rack then is returned to the bottom of the baking chamber. Here the chain passes around another sprocket wheel causing the rack to be elevated to the top of the chamber where the direction of travel again is changed by another sprocket. A sprocket wheel at the bottom of the chamber changes the direction of the rack to the horizontal, where it passes through the cooling chamber. The rack travels a total distance of 120 feet in the baking compartment and 60 feet in the cooling chamber.

Three baffles in the interior of the baking chamber, two at the bottom and one at the top, provide a uniform distribution of heat. The baffles at the bottom separate the first vertical lift from the return to the lower level and the second vertical lift from the second return. The baffle at the top of the baking chamber separates the first downward movement of the core rack from the second vertical lift. A vestibule at the entrance of the baking chamber reduces the amount of cold air sucked into the baking chamber. The vestibule is of a sufficient height to accommodate one or two racks always

passing through the inclosure. The plates on the core racks and the racks themselves reduce greatly the amount of air which enters the chamber. A burner at the top of the vestibule heats the cold air immediately upon entering the chamber.

Gas is used for fuel. The burners are located on one side of the oven, as shown in Fig. 2, and a temperature of 450 degrees Fahr. is maintained in the oven through thermostatic control. The core racks leaving the drying chamber pass through the 60-foot cooling chamber. A blower in the recuperator immediately beyond the drying chamber, draws heated air from the discharge end of the cooling chamber, shown in Fig. 1. This air picks up heat from the cores which have passed from the oven proper, and is discharged into the baking chamber. Recovery of heat results in a saving in the amount of fuel required. The oven and the recuperator section of the cooling chamber are insulated.

Approximately 64 racks are carried on the chain through the complete circuit of operations. Cores are made on the benches nearest the ovens, or on the row of machines on one side and are carried to the racks. In the near future, it is planned to move the machines and the bin sections to a point immediately adjacent to the oven, so that only a few steps will be required for the operator to carry the core from the machine to the racks suspended under the oven.

The racks move slowly toward the entrance below the cooling chamber and the oven. They are loaded as they pass along, so that under normal conditions, each rack entering the baking chamber will be filled. The rack has three shelves, each shelf 3 feet wide and 6 feet long. The distance between points where adjacent shelves are attached to the chain is 6 feet.

After the core racks have passed through the baking chamber and cooling compartment, they pass around the sprocket wheels at the end of the oven where they are unloaded. The cores are cool enough to be handled since the heated air is drawn off by the blower. They are taken from the oven racks and placed on other racks used in connection with electric lift trucks to haul the cores to the pasting and assembling department. Since it requires 3½ hours for one rack to make a complete cycle, the traveling speed is extremely slow and no difficulty is encountered either in loading or unloading the cores.

Counterbalances care for any contraction and expansion of the rack chain. One set of counterbalances is located at the recuperator end of the cooling compartment and another set is placed at the discharge end of the cooling compartment, as shown in Fig. 1. It is interesting to note that cores which required 5 hours of baking in the coke fired, rack type ovens now are baked in 3½ hours in the continuous oven. Cores are taken from the ovens to the blacking and supplementary drying department shown in Fig. 3. Rough places are smoothed and filled with daubing material. Cores used in the block assembly are cleaned carefully. Precision is one of the main requirements for block cores, therefore, practically all the parts are placed in jigs and filed to the exact thickness required. A jig used for this work is shown in the foreground of Fig. 3. The file is a cast iron bar with a number of V grooves machined on the cutting surface.

After the cores are filed, cleaned, smoothed and inspected carefully, they are dipped in blacking shown in the

Describes Coremaking

This is the second and concluding article on the core department of the Packard Motor Car Co., Detroit. The first article, which discussed methods of handling and mixing core sand and the equipment and processes used in producing the cores, appeared in the Dec. 1 issue.

Fig. 2—The Cores Are Dried in the Chamber at the Far End and Are Cooled in the Long Compartment extending to the Left

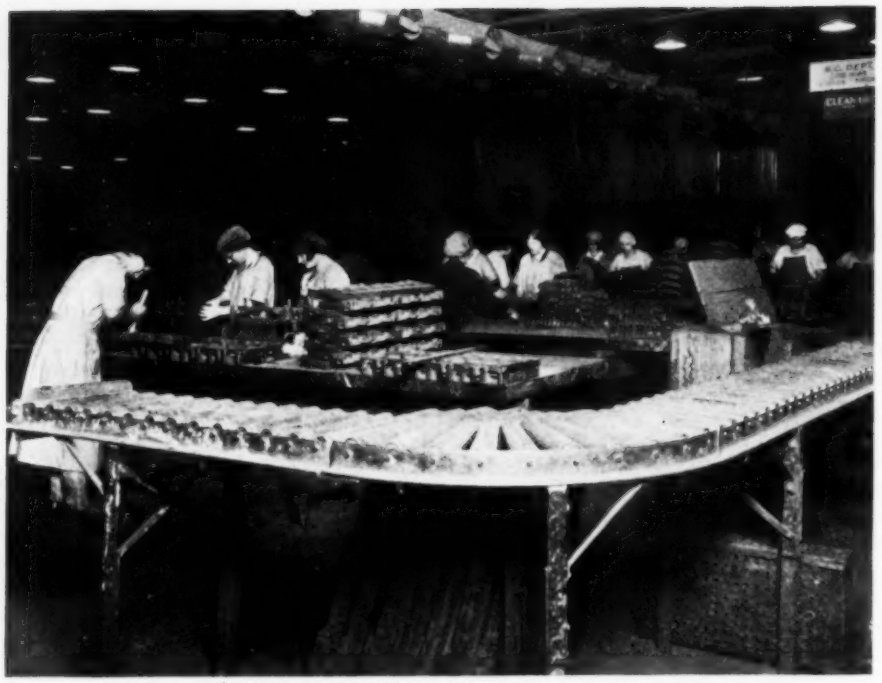


Fig. 3—Cores Are Filed, Inspected and Blackened in this Department

box along the roller conveyor in Fig. 3, and then are placed in metal boxes, shown on the floor under the conveyor. Practically all the cores are supported by pegs in the bottom of the pan, so that they do not touch each other or the pan to make an uneven place in the surface after drying. The boxes and trays loaded with cores move along the conveyor shown in Fig. 3, to the vertical type oven shown in the background of Fig. 4. The cores which do not need blacking are sent directly to the core assembly department. The base core, upon which the entire assembly is built, is not blackened, but is ground on a horizontal core grinder and then filed to exact size in a jig.

The oven used to dry the blackened and pasted cores is of the vertical lift type and was built by Holcroft & Co., Detroit. It is fired with gas and an almost constant temperature of 300 degrees Fahr. is maintained by thermostatic control. The oven contains 33 trays attached to an endless chain operating in a 40-minute cycle over sprocket wheels at the top and bottom. In other words a tray of cores travels in 40 minutes from the loading door, shown in Fig. 4, to the top of the oven and down the opposite side to the unloading door shown in Fig. 6. Some of the assembled cores also are dried in this oven, as will be explained later.

General arrangement of equipment in the assembling department is shown in Fig. 4. The cores are assembled on a rectangular power conveyor, two rails upon which 17 assembly fixtures are carried by a chain. A roller conveyor second from the front in Fig. 6 extends from the unloading door of the oven along the loading side of the assembly conveyor. All cores for the assembly which pass through the drying oven, remain in the boxes and are transported on the roller conveyor to the various points along the assembly conveyor where they are used. They are unloaded from the boxes and placed on benches within easy reach of operators on the assembly line and checked to determine any imperfections due to blackening.

Fig. 4—General View of the Equipment in the Assembly Department

Every step in the core assembly has been studied carefully to determine the most efficient method of procedure. The first man in the assembly line places the heavy slab core in the cast iron tray, which serves as a jig. This operator checks the core for height with a gage which fits over the two pins which may be seen at the ends of the assembly boxes or trays in Fig. 5. The same gage also checks the width of the core.

The core resting against the front and one end of the assembly tray, is clamped in place with the two clamps shown on the tray at the right side of the far conveyor line in Fig. 5. A short movement of the handle locks this clamp securely. The first operator then places the necessary chaplets on the core, daubs paste at the points where the exhaust and the intake cores and the jacket core will touch the slab core and drops a small amount of mud into the holes in the slab core which will receive the intake and exhaust cores. This small amount of material permits the cores to be registered in at the right height. The conveyor trays are in constant motion so that by the time the listed operations have been performed, the tray has moved into the second assemblying station.

The second operator sets the lower jacket core in place and checks it for height and for depth with gages which fit over the guide pins. After the core has been gaged properly, it is attached to the slab core in an interesting manner. Instead of using wire, molten lead is poured into ¼-holes extending through the parts of the core to be fastened together. Holes for the lead are pierced in the core at the time it is made, so that the work of leading is simple. The operator merely pushes an awl through the holes to clean out any loose sand and to make sure that the holes are in line. He then takes a small ladle of metal from the

gas fired melting pot at the back of three assembling stations shown in Fig. 5 and fills the hole. This metal solidifies quickly and holds the parts securely. Two holes are filled by the second operator to hold the lower jacket core to the slab core. After leading, the second operator puts in the print cores to hold the jacket core. The third operator sets the exhaust cores, puts in the bridge core for the intake core and then places the intake core. He gages the cores for height and leads the intake cores. The pencil of lead extends through the intake cores, the bridge cores and into the slab core.

The fourth operator checks the core for proper thickness of metal between the intake and the exhaust cores. If necessary he files the cores until a metal thickness of 5/32-inch is assurred. He places the top water jacket core over the lower water jacket core and rubs it over the lower core to make a good joint. He then removes the top water jacket core, cleans the face of the core with compressed air and dips the top water jacket core in the paste. The paste is held in a tank which also is provided with a frame corresponding to the face of the core to which the paste is to be applied. The operator raises or lowers the frame by operating a foot lever. When he desires to apply paste to the core, he raises the frame out of the paste and places the core on the frame, thus distributing the paste evenly over the surface and avoiding paste in the vents. The frame is allowed to drop into the paste and the core is placed on the lower water jacket core. He then raises the core to inspect the vents, lowers it again, gages it and leads it into place, using two circular anchors extending to the bottom of the slab core.

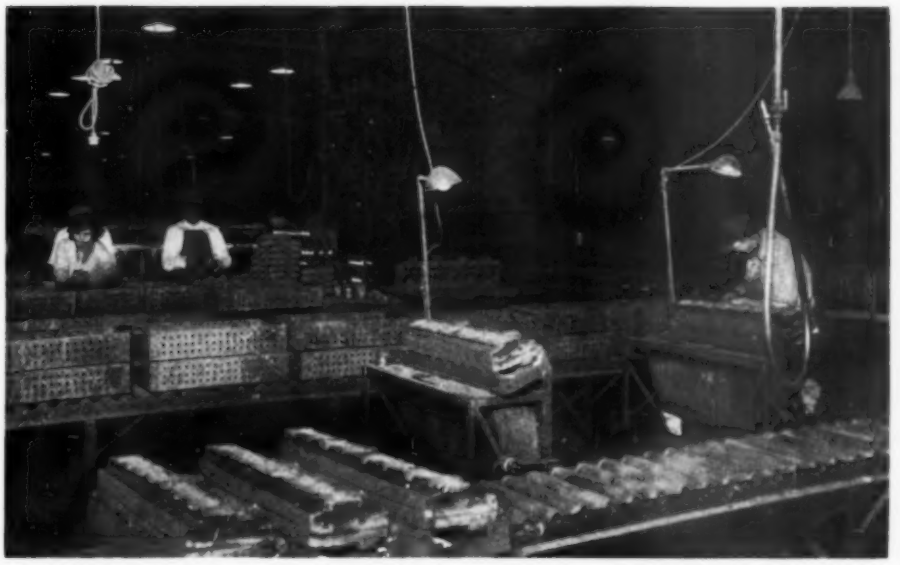


Fig. 6—The Assembled Cores Are Inspected on Special Rigs

Operator number five mends all the joints and fills all the cracks. Mud used for that purpose is fine molding sand and flour. This operator also inspects the metal thickness space between the top jacket and the intake. He then places one bridge core and two vent pin cores designed to carry the gas from the cores in the assembly. The sixth operator smooths all the joints which have been leaded.

The young lady shown at the left in Fig. 5 inspects and repairs the daubed parts to prevent fins in the water jacket, mends joints where necessary, and touches up the light sections in the water jacket core with thin blacking. She then cleans the core with compressed air, after which it is ready for the drying oven. Under the present operating schedule 265 cylinder cores are as-

Fig. 5—The Cylinder Cores Are Assembled on a Conveyor Line and Then Carried to the Continuous Drying Oven

sembled on the conveyor each day.

The conveyor carries the assembled core to the continuous oven, where the blackening and paste are dried. After drying, the cores are placed on a roller conveyor which carries them to a grinding machine, where the backs are ground smooth. The roller conveyor in the immediate foreground in Fig. 6, carries the cores from the grinder to the inspection department, shown between the two conveyor lines in Fig. 6. The inspection bench has a chamber constructed below which houses several incandescent lights. The core assembly is placed on the bench at an angle, as may be noted in the accompanying illustration, so that the cores are in a direct line with the eyes of the operator. A light above the bench also provides illumination so that it is possible for the inspector to see every part of the core surface with ease. The inspectors clean out the vents, smooth and inspect the cores and clean them with compressed air. The cores then are placed on racks immediately across the aisle from the conveyor, in the west end of the gray iron foundry and at a point near the molding stations where the cores will be placed in the molds.

Investigates Steel Valve Defects

By Herbert R. Simonds

CONSTANT effort to secure increased economy throughout the industry has resulted in the use of high pressures in steam power plant design. As late as 1915 steam pressures of 400 pounds per square inch were unusual in central station design. Now this same pressure is practically the minimum for large power plant construction, and pressures of 600 and 900 pounds per square inch are standardized fairly well.

All of this has had a marked effect on foundry practice in connection with valves and fittings. Cast iron valves and fittings were found fairly satisfactory for steam pressures up to 250 pounds. Above this difficulty due to porosity of the metal and lack of tensile strength was encountered. It became apparent to foundry engineers that cast steel valves and fittings would have to be used. At first castings were made from bessemer and open hearth steel. The patterns used were the same as those used for cast iron. Gating and application of shrink heads were left to the ingenuity of the molder or foundry foreman.

Due to the greater shrinkage of steel, its high pouring temperature and the presence of gases in the metal which were not eliminated before the castings solidified, this practice resulted in many defects in steel castings produced. In the spring of 1920 the American Engineering Standards committee realizing the need of new standards in the production of cast steel valves and fittings called representatives of various associations together with the result that a committee on the standardization of pipe flanges and fittings was formed.

After several years of research a system of standards was adopted, and this recently has been published by the American Engineering Standards committee. Not only are complete dimensions for steel flange fittings listed, but the physical properties are included. These standards run up to and include fittings for pressures of 1350 pounds per square inch.

One of the companies active in this standardization work is the Walworth Co., Boston. This company has gone much further in its research work. It recently has completed a series of tests of the physical properties of cast steel at temperatures ranging from 70 to 1200 degrees Fahr. From this series of tests the physical properties of steel castings necessary to withstand high temperatures and pressures were determined. However, it was an entirely different matter to secure such properties in foundry practice.

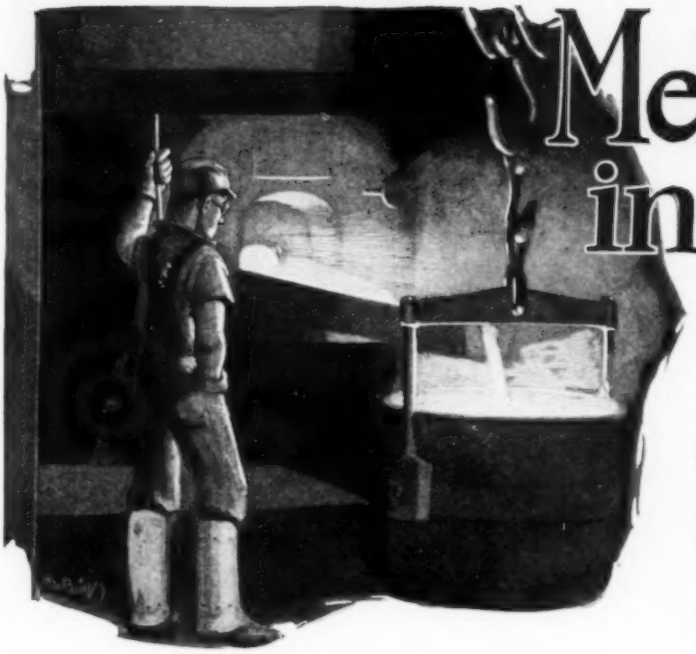
The Boston plant of the Walworth Co. is located but a short distance from the Watertown Arsenal where one of the largest steel-testing, X-ray laboratories in the country is located. It is only natural therefore that the Walworth engineers should turn to this laboratory for assistance in working out their foundry practice. Examination by X-ray showed that castings made according to the best previous practice were far from uniform and showed defects of various kinds. With the X-ray analysis as a guide, various factors were altered in the subsequent experimental work, and the results of each change carefully noted.

At first the steel itself was studied. Acid electric furnace steel was used because it was believed that this process could be more easily controlled than the bessemer or open-hearth processes. Gradually the quality of steel best suited to foundry practice was determined. After this, the next step was to attack the problem of foundry technique. All phases of this branch were studied, including cores, molds, risers and sands. Here X-ray examination was of the utmost importance. Lead numbers placed on the castings showed in the X-ray pictures and thus indicated the location of the various defects.

Early in the investigation it was found that the shrink heads or risers were far too small, and the engineers learned that success of steel foundry work largely depends on the proper application, location, size and shape of shrink heads. As a result of this, carefully designed shrink heads were made as integral parts of each pattern thus insuring the use of standardized shrink heads every time the pattern is run in the foundry.

The next problem was the determination of the proper heat treatment for high pressure castings. Steel of any given analysis attains its highest quality when its chemical and molecular structure is of a certain definite nature. Steel as cast, seldom is in this desirable condition. This is due to shrinkage strains and to unequal cooling. To overcome these factors it is necessary to subject the castings to a heat treatment. There are many ways of doing this and because of the large number of variables involved the subject is one where standardization is difficult. However, it generally is understood that this phase of steel foundry practice requires as careful attention as any other.

A fourth field of investigation conducted by the Walworth engineers has been that of design of the fittings themselves for best structural features. This includes working tolerances in machining as well as tests of the materials other than castings. At temperatures above 500 to 550 degrees Fahr. bronze is not suitable as a trim material, and some other material must be used. Nickel-copper alloys have been employed satisfactorily and experimental work with other alloys is in progress. This development work is of interest, not only in the valve and fittings field but to the entire steel foundry industry.



Melting Iron in the Cupola

Part VIII

By J.E.Hurst

Discusses Charging Equipment

SUCCESS of mechanical devices in distributing the materials uniformly in the cupola has dispelled nearly all the early prejudice that at one time existed against the introduction of this type of equipment. Several charging devices are available and the design is so elastic that they may be fitted to serve either under ordinary conditions, or, under other conditions prevailing in old plants operated for many years under a different system. The crane or monorail system may be utilized between charging periods in unloading pig iron and scrap with a magnet, limestone, coke and sand with a bucket. Where other conditions are favorable, the magnet also takes the place of the old-fashioned tripod and pulley blocks employed in hoisting the drop ball for breaking scrap.

THE side dump charging machine shown in Fig. 53, designed and manufactured by the Whiting Corp., Harvey, Ill., facilitates charging material into the cupola. It involves the use of trucks conveniently designed to be locked in position on the table of a pneumatically or hydraulically operated tilting machine. This is essentially a charging machine without any lifting and lowering devices and finds extensive use in many American foundries operating on large tonnages. With a suitable arrangement of the cupola stage where the trucks can be transferred readily to the tilting platform, exceptionally economical results are obtained. Special attention is directed to the chain doors, operated pneumatically.

An extremely simple and ingenious hand operated balanced charging machine also has been designed by the same firm. This is a cast iron distributing block attached to the end of a steel beam, supported at the center by a pin, and counterbalanced so that it can be moved easily into and out of the cupola by hand. The charges of iron and coke are carried separately in balanced cars equipped with roller bearings. These cars with full load may be turned easily by one man. No turntables are required, the curved angles on the floor act as guides easily locating the car relative to the charging floor of the cupola. A steel charging floor is required.

The *modus operandi* is clear from the illustration Fig. 55, which shows the charger installed on a cupola lined to 45 inches inside diameter. It is claimed that this charger secures uniform distribution of the charge and that it is applicable to old and new cupolas. It is recommended for any cupola over 45 inches inside diameter. Location of the distributing block with respect to the cupola is adjustable by moving the tilting beam horizontally in and out of the cupola if a change in distribution of the charge is found necessary. Later development of this idea now is available.

The primary object in the use of drop bottom buckets is to insure regular distribution of the charges, a difficult feature in large cupolas with side tipping buckets and charging chutes.

Drop bottom buckets vary in the mechanism for opening the bottom doors, but all buckets are designed a few inches less than the diameter of the cupola lining. They enter the cupola where the contents are discharged en-bloc. If the bucket is charged regularly, the charge will be deposited properly in the cupola. Difficulty of insuring regularity in charging is more apparent in large than in small diameter cupolas.

One of the simplest types of drop

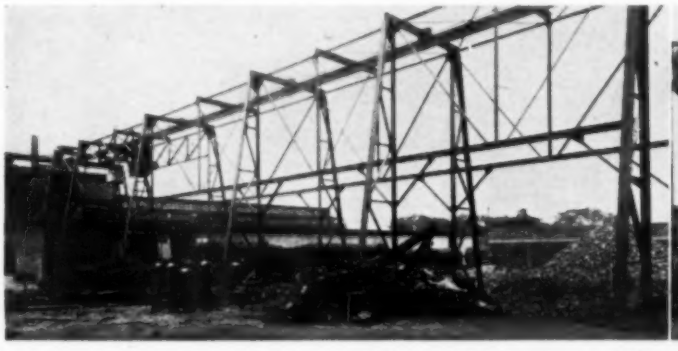


FIG. 47—(LEFT) MECHANICAL CHARGING EQUIPMENT WITH MONORAIL RUNNING IN A STRAIGHT LINE OVER THE STORAGE YARD.
FIG. 48—(RIGHT) THE CHARGING CAB OPERATES OVER A TROLLEY TYPE I-BEAM CRANE

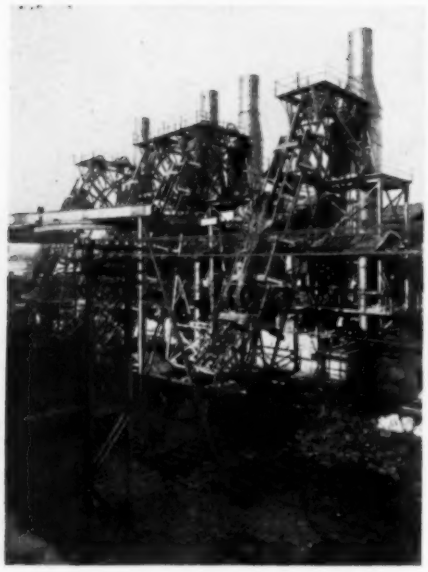


FIG. 49—CUPOLAS AND CHARGING MECHANISM IN AN ENGLISH FOUNDRY

bottom bucket, illustrated in Fig. 52 by courtesy of the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., is a cylindrical mild steel shell with riveted stiffening bands at the top and bottom and provided with a suitable hook for attachment to the crane. The bottom of the bucket is closed by two semicircular flap doors hinged to a diametrically disposed rod and locked by the lever controlled latch, clearly shown in the illustration. The levers controlling the latches are operated by a yoke type operating lever surrounding the bucket, which in its turn is operated by a wire rope from the cab of the crane type charger or any other convenient place. In operation, the full bucket with the doors latched is placed inside the cupola by the crane. The bottom doors are unlatched and released by a pull on the latch release cable, and the charge is deposited in the cupola. The bucket then is withdrawn and the bottom doors either reclosed by hand or by simply lowering until the bucket rests on the charging floor.

Another type of bucket, illustrated in Fig. 51 by courtesy of the same firm, is described as the umbrella type. The object of this type of bucket is to obtain better distribution of the charge toward the center of the cupola.

A slightly modified form of the former type of drop bottom bucket is illustrated in Fig. 56. The two semicircular hinged doors are operated by four levers *D* and *E* attached to two specially formed links *N* arranged to move vertically in the slides *P*. The doors are held closed by wire ropes attached to the links *N* and controlled from the operating platform. This type of bucket is used with the charging arrangement illustrated in Fig. 49.

An ingenious form of collapsing bucket which automatically opens when lowered into position is illustrated in Figs. 54 and 58 by the courtesy of Cochrane & Co. Ltd., Middlesboro, England. In the application of this bucket the top of the cupola is equipped with cast iron curved bearer rails as indicated in Fig. 54, which also clearly shows the form of the bucket and the manner in which it opens by weight of the material contained. The loaded bucket is raised and lowered in the manner diagrammatically indicated in Fig. 54 and the charge automatically is deposited in the cupola. A loose link to prevent collapse is used when loading the bucket at ground level. The link is removed immediately after the loaded bucket is suspended on the crane.

Drop bottom buckets can be filled with the correct charge at the ground level. Various types of special purpose cranes are available to hoist the bucket from the ground level, bring it into position in the cupola and drop the bottom for discharging. A typical example is shown in the illustration Fig. 51. This is based on standard cage controlled monorail hoists, in

FIG. 52—CHARGING BUCKET WHICH HAS THE BOTTOM HINGED AT THE CENTER

which a front trolley is attached to the structural frame in such a manner that the snout of the hoist projects into the cupola.

A similar arrangement adapted for ground level control is illustrated in Fig. 50, which also illustrates an ingenious arrangement for charging two cupolas with the same charging hoist. In this arrangement the I-beam monorail is pivoted in the center and suspended by trolleys from two curved segments. The charging hoist may be directed toward either of the two cupolas.

Drop bottom buckets also are utilized with a chute extension to the charging door. A convenient arrangement of a removable chute can be adopted where a substantial charging platform is in existence. The chute is mounted on a four-wheeled bogie maintained in position at the charging door by hooks attached to the side of the cupola.

Individual needs and layout of a particular foundry constitute the most prominent consideration, and it will suffice in this connection to describe and illustrate several typical systems.

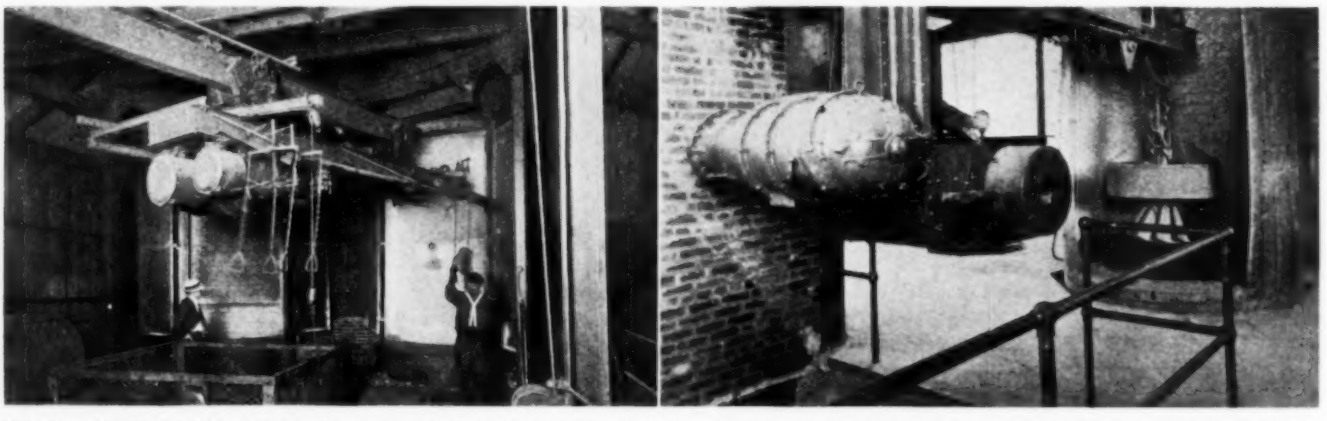
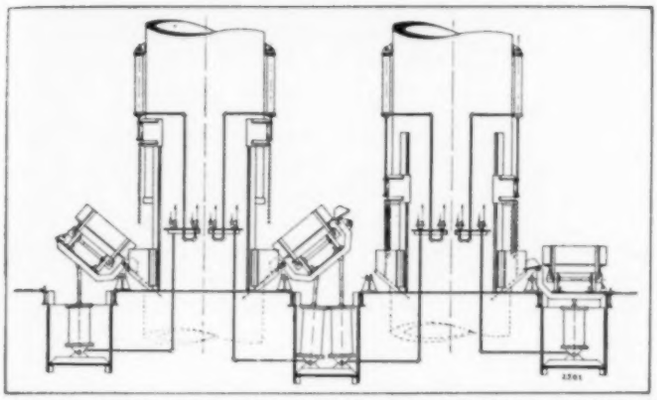


FIG. 50—(LEFT) FLOOR OPERATED TYPE CHARGING CRANE. FIG. 51—(RIGHT) CAB OPERATED CRANE AND A SPECIAL TYPE OF CHARGING BUCKET



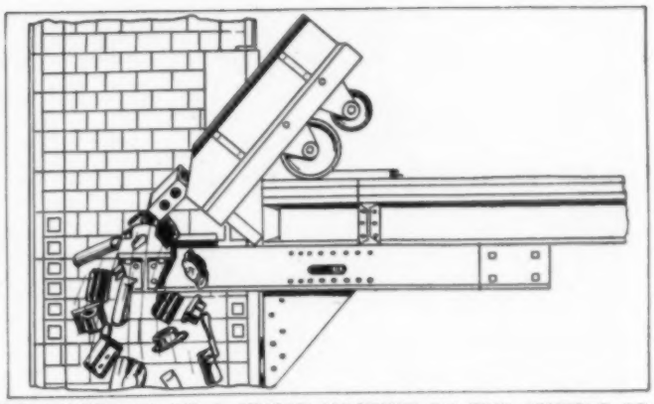


FIG. 53—CUPOLAS MAY BE SERVED BY A DUPLEX MACHINE IN THE CENTER OR BY A SINGLE MACHINE ON THE OUTSIDE OF EACH. FIG. 55—BALANCED TYPE CHARGING CAR

In many places, the stock yard is served suitably by a monorail system leading to the cupola. This system necessitates placing the monorail at a height that in some instances may prove inconvenient, unless the monorail is used in conjunction with an electric hoist. Charging buckets are filled direct from the stock yard and each charging bucket is suspended from an automatic scale which constantly indicates the load. Full buckets on the monorail are led to elevators and raised to the charging level where the contents are dumped into the cupola by hand.

One application of the Rein inclined runway is illustrated diagrammatically in Fig. 57. The horizontal monorail serving the stock yard has a small piece of rail suspended from the inclined monorail and operated by the cable and winch. The crane is brought to rest at the end of the horizontal monorail, suspended on the small piece of rail which in turn is suspended from a crab on the inclined monorail. This is disconnected and pulled up the inclined rail. Arriving at the top, the small piece of rail locates in a space in the runway, thus enabling the bucket to be moved along.

The ends of runways are arranged to close automatically; thus preventing all accidents. Power required by the winch is extremely small, as half the load is counterbalanced.

A cage controlled hoist of the type described obviates the difficulties arising from the height of the monorail. The stock yard can be covered by a monorail hoist in conjunction with a transfer crane as shown in the two illustrations, Figs. 47 and 48.

This system is of considerable interest. Incoming pig iron and scrap may be unloaded by magnet attachment. An electrically operated grab bucket may be utilized for handling molding sand and other loose materials. The transfer crane is of the traveling crane type equipped with motor and traveling gear operating on gantries covering the stockyard. The transfer crane carries an I-beam which may be brought in line with the I-beam monorail track to the cupola. This equipment affords almost complete control over handling of raw materials and has found extensive application in many foundries.

Part of the complete mechanical charging plant on the four cupolas which supply molten metal to the "spun" pipe plant of the Stanton Ironworks Co. Ltd., England, is illustrated in Fig. 49. This plant is operated in conjunction with a specially designed bunker storage with a capacity of 750 tons iron, 120 tons coke, and 45 tons limestone, approximately two days' supply. A scale transfer car collects the charge in drop bottom buckets referred to previously, which are transferred to the inclined charging hoists as shown in the illustration.

Electric magnets cannot be used readily for direct cupola charging, but they find extensive use in large plants, unloading pig iron and scrap consignments. Original application of electromagnets, about a century ago, for lifting materials is attributed to Arago in France, and to Sir William Sturgeon in England. Their industrial use appears to have been adopted extensively first in the United States about 30 years ago. Since that time their use has extended rapidly.

Three types of electric lifting magnets have been evolved: (1) The circular type magnet for handling loose material. (2) The rectangular type for handling sheets and plates. (3) The bipolar magnet for handling material with regular sections and billets.

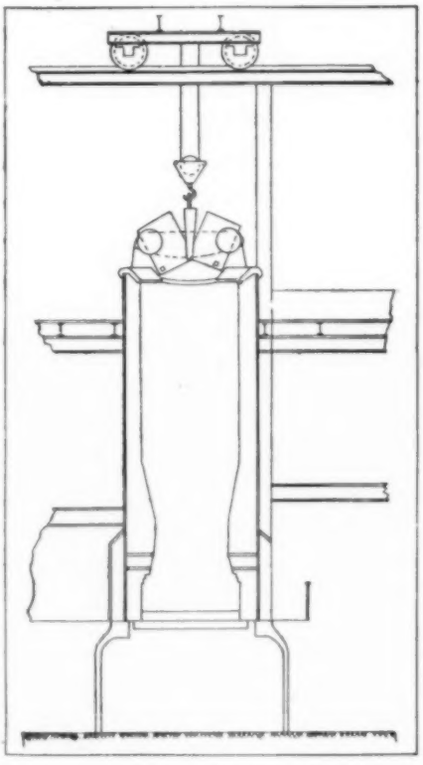


FIG. 54 — SKIP OPEN AUTOMATICALLY WHEN WEIGHT RESTS ON BEAMS

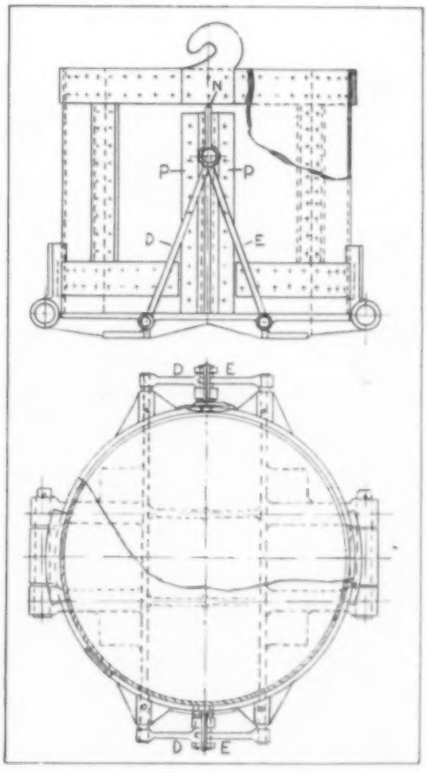


FIG. 56—PLAN AND ELEVATION OF DROP BOTTOM BUCKET

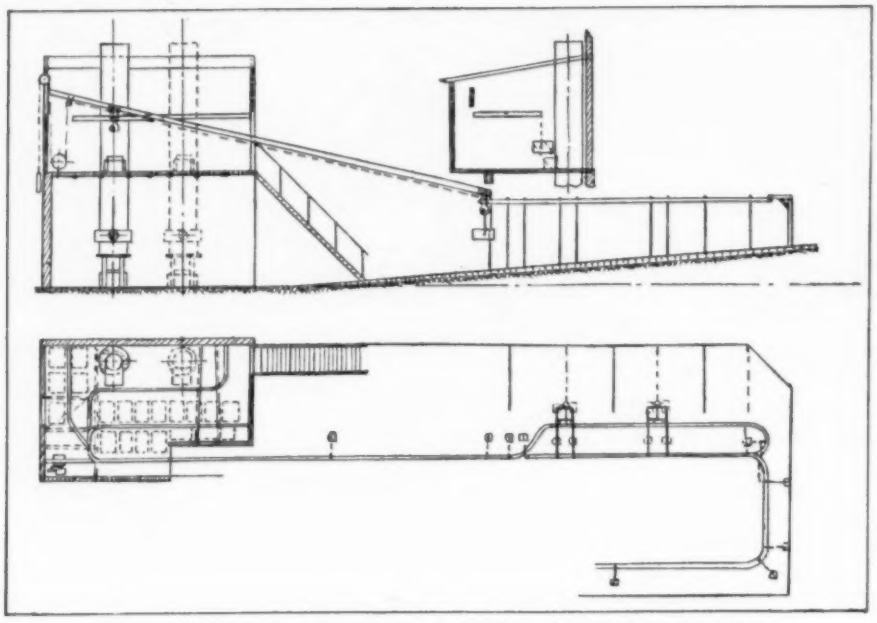


FIG. 57—MATERIAL IS CARRIED ALOFT ON AN INCLINED MONORAIL

We are principally concerned with the circular type magnet for handling loose pig iron. The circular type magnet, employed for handling pig iron and scrap, consists of a shell casting of high permeability steel, machined inside to receive the energizing coil and fitted with lugs on the top for suspension purposes. The coil, usually of copper tape, is carefully designed and special precautions are taken with the insulation. Leads are brought from the energizing coil to a terminal box to which the external leads are connected. Magnets generally are controlled by a drum type controller, similar to the ordinary street car pattern, or operated by automatic contractors controlled by a master switch. Robust switchgear always is desirable and suitable resistances are provided to absorb the induced current on breaking the circuit and for regulating the lifting power. A demagnetizing arrangement is provided to ensure instantaneous release of the load.

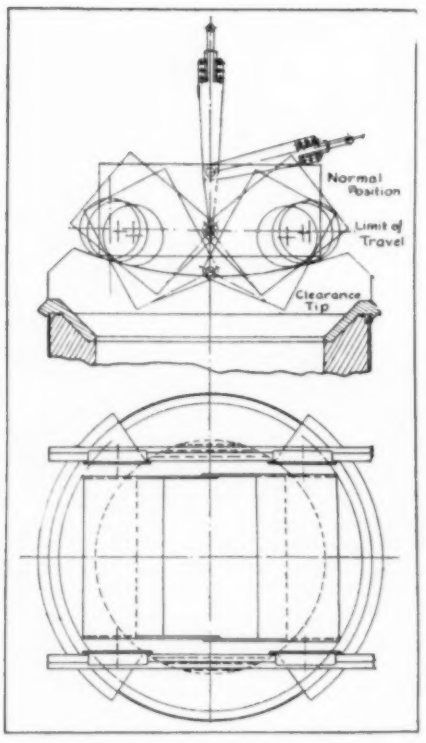


FIG. 58—GENERAL ARRANGEMENT OF CUPOLA CHARGING SKIP

Magnets operate on direct current circuits and where alternating current only is installed a motor generator set becomes necessary. Various devices are adopted for taking up the cable slack on the magnet. Usually it is taken up on a winding drum operated by a separate motor or driven from the main crane gearing. Alternately a series of conpensating pulley and weights are used.

Lifting power of a magnet depends on the nature of the material lifted. With a solid load, a magnet will lift from 5 to 15 times its own weight, depending on the size of the magnet. For example, a 26-inch diameter magnet, weighing 600 pounds, will lift a block of steel weighing 5 tons and a 66-inch diameter magnet, weighing 3 tons, will lift a block weighing 15 tons. When handling light scrap, the load lifted is greatly reduced, coming down to about 150 and 1200 pounds, respectively, in the examples quoted.

Advantage in using electromagnets makes itself apparent in the speed at which the material can be handled, due to the saving in time while attaching and detaching the load. The lifting power can be increased when handling loose scrap material by the use of the gripping attachments illustrated in Fig. 59. A good craneman on a fast crane and assisted by a ground man can unload pig iron at the rate of 60 tons per hour. The electromagnet finds a useful sphere of operation in the foundry breaking scrap material. A spherical skull cracker is used, so that no matter how it falls, it can be picked up readily by the magnet. A 66-inch diameter magnet will lift a ball weighing 8 tons.

Modern magnets do not require any reserve power supply to cover the commercial variations in voltage. However, men should be prevented from walking underneath loaded magnets. The current might fail, thus immediately releasing the load. Good practice favors wiring magnets from the main circuit, or a single circuit, to obviate danger of the circuit breaking from causes arising out of the operation of other machinery on the same circuit.

Wants Bronze Racks

William L. Banning, Capital Advertising Associates, Westory building, Washington, is inquiring for the names of foundries making solid bronze racks, approximately 6 x 6 feet of ornamental nature and provided with pockets to contain railroad folders.

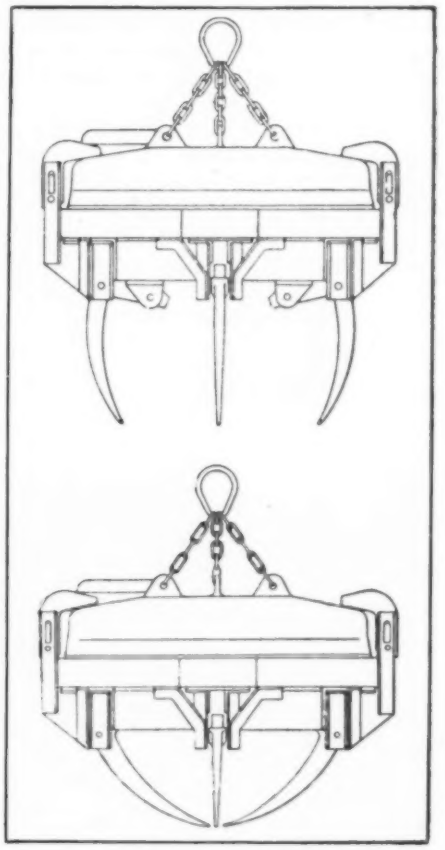


FIG. 59—MAGNET WITH GRAB ATTACHMENT FOR HANDLING LOOSE SCRAP—OPEN AND CLOSED

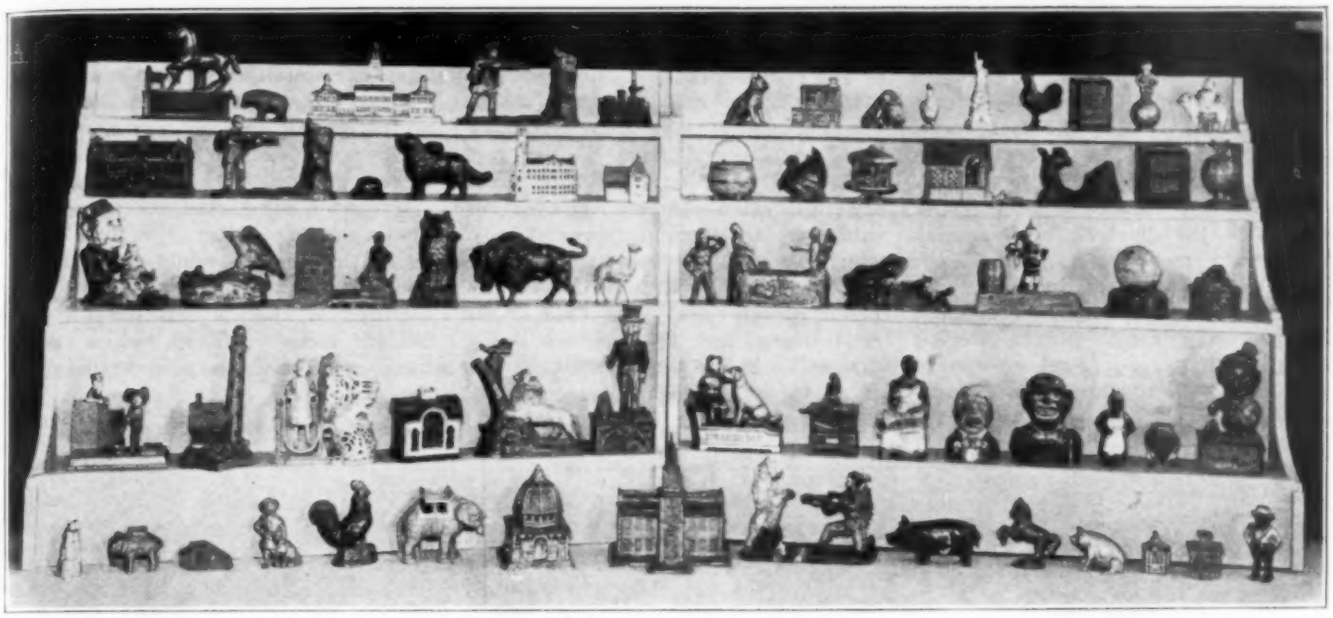


Fig. 1—A Group of Cast Iron Banks from the Collection of David Moskowitz, Now Owned by the First National of Detroit

Made Saving a Pleasure With Cast Iron Banks

BENJAMIN FRANKLIN in *Poor Richard's Almanac*, which began publication in 1732, said, "A penny saved, is a penny earned." Probably no person of that period exerted a greater influence on the people of the United States of America, than did this illustrious man. His teachings and proverbs on thrift still are quoted as teaching the way to prosperity.

While Franklin did much to promote frugality, it remained for George Morris, of revolutionary fame, and a few of his associates to found the first banking institution in the United States. These men opened a bank in Carpenter's hall, Philadelphia, in 1780.

Since that time banking has grown to be one of the most important business institutions in the country. However, the growth of the banking system parallels the growth of industry. The banking business does not lead, it follows. It is dependent upon the income of the various industries and upon the wages of the workers. Consequently, it is natural that banks should promote saving among the wage earners in their communities.

From a meager beginning, the savings department of the banking system has become one which involves millions of depositors and billions of dollars. At first only adults were encouraged to consecrate a portion of their earnings to the future, but it finally became evident that to build a lasting and increasing business in this department, it was necessary to teach thrift to children. Many methods were used but the toy savings bank was found to bring the best returns.

These banks were made of cast iron and many were mechanical toys. David Moskowitz, a Philadelphia antique dealer, has made the gathering of cast iron toy savings banks his

Fig. 2—The Kicking Mule Bank, Captioned, "Always Did 'Spise a Mule." Fig. 3—After the Coin Is Deposited the Mule Kicks the Boy Off the Stump

hobby. He has about 125 different models in his collection, many of them dating back to the time when our grandparents were children. This group is described as the most complete in existence. It recently was purchased by the First National bank of Detroit for exhibition purposes to show how the children of yesterday saved their money. A part of the collection is pictured in Fig. 1.

Kathryn Bugbee, who wrote about the cast iron banks in the *Detroit News*, says:

"When little Tabitha, a grandmother now, was given a penny, she would ponder at great length on the different ways in which it might be spent. A tiny bag of licorice lozenges might be hers, or a wee china doll, a lump of spruce gum, or a gaily-painted pencil.

"If Tabitha was thrifty, as small maids of an earlier period were wont to be, the penny would join other small coins in her savings bank. If it happened to be one of the ingeniously constructed mechanical banks which received the coin, Tabitha had her moneys worth of fun depositing it."

However, times have changed since that period. In those days toys were few and expensive, practically all the toys of that time being imported from Germany. As lately as 1904, Germany exported 89 per cent of the toys used in the United States. Since that time this country gradually has risen until it now is the largest producer of toys in the world.

According to the biennial census of manufacturers by the U. S. department of commerce, in 1925 the value of the toys made in the United States was approximately $75,000,000 against $27,000,000 for Germany our nearest competitor. This industry supplies 95 per cent of the domestic trade and exports 4 per cent of its products. The imports of toys into this country have dropped from 89 per cent in 1904 to 5 per cent in 1925. There are 361 establishments devoted entirely to the manufacture of toys which employ 14,001 wage earners and whose payrolls total $14,194,018. These makers deal with over 20,000 retail stores and 1300 jobbers.

New York has the greatest number of producers, 106, Ohio is second with 47, and Pennsylvania third, with 34. Massachusetts has the largest number of retail stores, 2468, Pennsylvania next, 2271, and New York third, 1913.

Many of the toy manufacturers make cast-iron playthings and quite a few of these make savings banks, but they are lacking in appeal to children. Only a few have the mechanical principle and the fun making idea involved in their design. As Kathryn Bugbee says, our grandparents got their money's worth of fun in depositing their coins in their kicking mule bank, one in which a fractious mule kicks its rider and knocks him off the log when the coin is deposited, as illustrated in Figs. 2 and 3, or the bucking pony bank in which the penny is placed in the boy's mouth and the pony bucks him off, the coin falling into the bank, shown in Fig. 4.

The William Tell bank depicted in Fig. 5, was another favorite. This represents William Tell shooting a penny off his small son's head in the bank. The Punch and Judy always was attractive to children. The coin is placed on Judy's frying pan and when Punch strikes her with a stick, Judy throws the coin into the bank. This is accomplished by pulling a lever.

Tom the Piper's son was represented among the toy savings banks of this period. When a coin was placed in a slot, the child pulled a lever and a pig kicked the penny into Tom's mouth. After Tom had swallowed the coin, he would roll his eyes and stick out his tongue. Skill was required to operate this bank and it helped many children while away many pleasent hours operating this toy.

In addition to these banks which represent characters or incidents in childrens tales, there were those that represented events of the times. One savings bank, dated 1886, represents a stump speaker who drops the coin into his carpet bag and moves his mouth and an Uncle Sam bank that acts the same way. The Jolly Niger rolls his eyes when he puts a coin in his mouth and a lever drops it out of sight. The Black Mammy bank is made on much the same lines.

In those times of long ago, many of the banks were extremely elaborate mechanically. The darktown battery bank, in which the pitcher throws the coin into the catcher's chest protector from whence it drops into the bank and the batter swings his bat, is one of this type. Another is one in which a hod carrier drops a coin into the bank and a mason lays a brick. Another is made in the form of a birds nest. The mother bird leans forward, flaps her wings and opens her mouth to drop the coin into the nest and the little birds open their mouths and move toward their mother. In this class were the monkey banks in which

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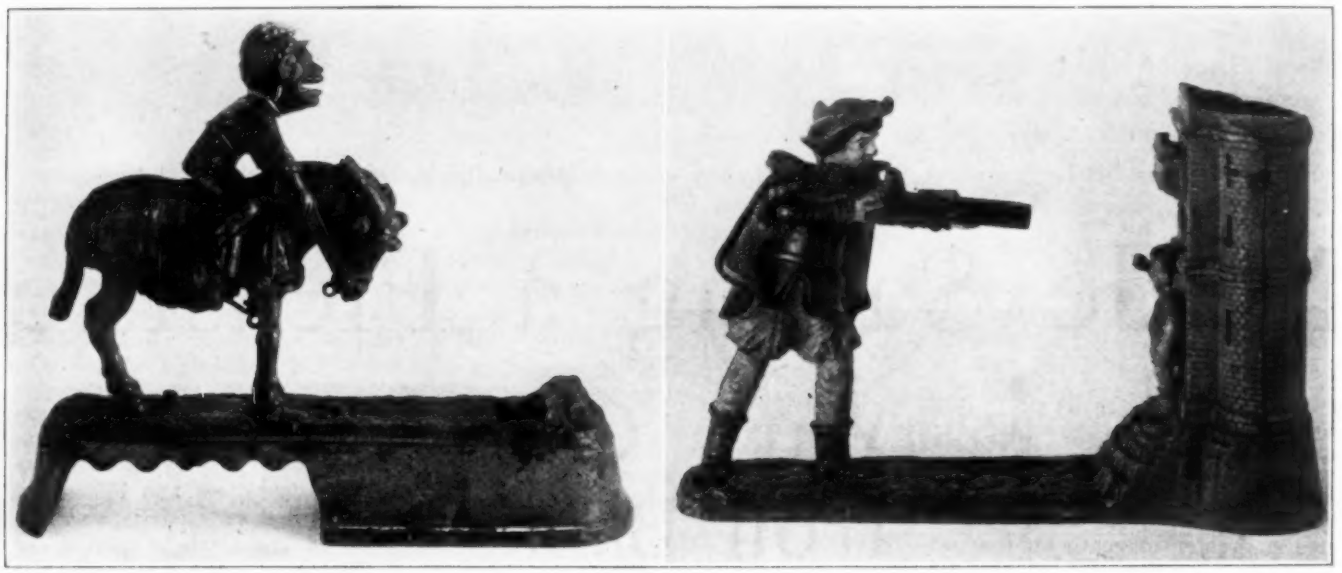


Fig. 4—The Pony Throws the Boy Over His Head, and the Coin in the Boy's Mouth Goes into the Bank. Fig. 5—William Tell Shoots the Coin from His Boy's Head into the Bank

Cover Costs and Education

National Founders' Association in Annual Meeting Discusses Problems Affecting Foundry Personnel

WELL-ROUNDED programs were provided for more than 225 members present at the thirty-second annual convention of the National Founders association at the Hotel Astor, New York, Nov. 21-22, as briefly reported in THE FOUNDRY, Dec. 1. Cost and production problems, industrial education, labor and legislative questions all came up for serious discussion. Sales and business methods and broad economic phases also were interestingly presented.

Of exceptional success was a convention breakfast, which was attended by more than 50 members and dominated by a lively discussion of foundry salesmanship. C. H. Hoffstetter, of the Odin Stove Mfg. Co., Erie, Pa., presided.

Describing present day prosperity as a state of mind rather than a fact susceptible of demonstration, Virgil Jordan, chief economist of the National Industrial Conference board, declared that the weakness in the present situation is that production is being more rapidly financed than consumption. He, therefore, believes that the solution lies in the field of finance and banking.

That production automatically finances consumption is a fallacy, Dr. Jordan declared. The circle of production and consumption upon which economic progress must depend cannot be made complete until some way is found of controlling and distributing consumer purchasing power in relation to productive power. At present, the speaker declared, the country is in the midst of a profound evolution of financial methods and policies and it will be the problem of the next few years to develop these policies and methods to prevent undue utilization of the country's credit resources through speculation and to keep consumer purchasing power in step with production. Several important papers were presented.

Consider Iron Melting Practice

DISCUSSION on foundry practice was featured by two papers, one by H. V. Crawford, the General Electric Co., Schenectady, N. Y., entitled "Automatice Blast Gate Control for Cupolas" and the other by H. M. Lane, Detroit, entitled "Melting Practice." Both addresses were illustrated by lantern slides. In Mr. Crawford's address, he outlined experiments in cupola practice and described a device designed to give more effective combustion. He said the union of the oxygen of the air and the carbon of the coke makes the problem of air supply a highly important one.

He described the automatic blast gate control as a device by which the air is actually weighed. So many pounds of air containing so many pounds of oxygen can be delivered to the cupola in order to burn so many pounds of coke in a definite time. In other words, Mr. Crawford said the equipment can be considered as scales for weighing the air. He said the foundryman can determine the proper relation of coke and air to give him the best results for his particular condition.

He emphasized the importance, once the air is weighed, of taking proper steps to see that all of it is used in the cupola. The loss should be confined to that escaping through the side hole, he said; also that the tuyere should be continuous so as to give even distribution all around the cupola. The tuyere also should be of the proper depth so as to force the air into the center and eliminate not only the possibility of a cold spot forming in the center, but the air traveling up the side.

Discusses Air Required

He discussed the amount of air required, effective temperature, barometer and humidity. He declared the weight of a certain volume of air will change the temperature and barometer and that therefore blowers should be operated to give not constant volume but constant weight.

Mr. Crawford also dwelt upon the effect of excess oxygen, the effect of insufficient oxygen, effects of pressure, method of control, and blower characteristics.

Declaring that foundrymen should become oxygen-minded instead of air-minded, Mr. Lane discussed many important phases of cupola practice. He weighed the relative merits of the electric furnace and the cupola, asserting that while the former is highly effective in certain cases, the cupola in his opinion always will be widely used. From a fuel standpoint he thought the cupola the most efficient furnace ever devised.

The speaker discussed efforts to conserve heat. He described a French process which had an auxiliary wind belt two or three feet below the charging door, the direct object being to dilute the carbon monoxide to such an extent that it will not explode. While this method showed good saving, it required too careful operation to be practical and was later abandoned by the designer.

The substitution of oil for a portion of fuel in the melting was the next important step, the speaker declared. In some sections where coke is fairly high priced and oil low priced, quite a saving can be shown. However, according to Mr. Lane, the difficulty is to maintain the rate of oil flow and the excess oxygen on the one hand and the amount of coke added to the bed on the other, so as to keep the bed at the proper height and avoid the oxidization of the iron. The method required a higher grade of labor than necessary for the ordinary coke fired cupola.

He described some experiments in the use of powered coal. In this case, he said, the coal is burned in auxiliary combustion chambers outside of the cupola. As in the oil-fired cupola, the bed must be built up at a rate proportional to the excess of air introduced. In both cases, the element of hydrogen is injected. This, he said, may not be wholly an unmixed blessing. On the one hand the resulting components may break down to oxidize the descending charge, while on the other hand, the burning of the hydrocarbon certainly will prevent the excess of CO gas in an all carbon fuel.

The speaker outlined efforts to utilize waste heat and described briefly the hot blast cupola. He said a practice similar to that followed in blast furnaces is followed and such products of combustion as are extracted are burned with the addition of a small amount of oxygen and used to preheat the blast. Mr. Lane believed that efficient cupola practice would result from a combination of the hot blast system and the automatic blast gate control of ingoing air.

Describes Furnaces

The speaker discussed types, which he classified as special furnaces and also described various installations of electric furnaces. He divided these latter into two classes, namely, the direct arc and indirect arc. The speaker said that electric furnace iron has a few advantages. Superheating provides better deoxidization, which results in a product that weighs more per cubic inch, has a finer grain and will run 25 per cent more in strength. However, he added, that there probably are no locations east of the Rocky mountains where electric furnace iron will not cost more than a corresponding cupola product, although in at least one case, where the company finishes its own product, the final figures favor the electric furnace iron.

In the operation of direct arc furnaces, Mr. Lane stated that a new and third method has recently been put into commercial operation which calls for a fairly large furnace so that the process may be continuous. The indirect arc furnace is usually of a rocking type. This he said is not well suited for melting down heavy or chunky material but in melting fine material has certain distinct advantages over the direct arc.

Breakfast Meeting Studies Sales

AN INNOVATION was inaugurated by a round table breakfast held Thursday morning under leadership of C. H. Hoffstetter, Odin Stove Mfg. Co., Erie, Pa. and devoted to problems of foundry salesmanship. Mr. Hoffstetter emphasized the need for personal contact with the trade, through acquaintance with officials of the customer firms, the value of honest, painstaking service and a knowledge of trade requirements of castings sold.

W. H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa. affirmed the value of personal contacts, but stated that in general, castings are poorly sold. He said that executives will spend large amounts on cost systems and hours in determining what costs govern certain castings and then in a few minutes will discard this knowledge and cut costs to meet a competitor's bid. Castings business should be obtained upon the basis of a one price bid. The flat price for a job lot of castings is ridiculous and a schedule of sliding scale prices is almost as bad.

Salesmen Must Be Trained

Training salesmen, said Mr. Worrilow, is a most important duty of foundry managers. Cost systems are a basic need and having a cost system, the seller should have the faith of his convictions and refuse to quote on a competitor's bid. It is the duty of every salesmanager to go over cost sheets. Those jobs which show a profit should be continued, but those which show a loss, should be blue penciled and the castings salesman should sell the customer on the need for a higher price on the losing work.

W. H. Kleppinger, Calumet Foundry & Machine Co., questioned whether contacting the higher executives might not alienate the good will of purchasing agents, who might feel slighted by thus going over their heads. This might be avoided, according to other speakers, by executives of foundries making the acquaintance of executives of customer firms and leaving the actual selling to foundry salesmen, working through the buyer's purchasing departments. Mr. Kleppinger stated that many valuable leads to new accounts might be secured through old customers.

Costs Handled by Local Groups

FOUNDRY costs were the subject of an animated discussion, led by John L. Carter, general manager of the Barlow Foundry Inc., Newark, N. J. Evidence was produced by various speakers to show that participating foundries virtually without exception have profited not only in the matter of uniformity of cost accounting methods, but in respect to production problems and conditions generally. The advantages of local cost groups were especially stressed.

Relative to prices, Mr. Carter said that members of the Newark cost group, for instance, upon the occasion of a distribution of theoretical cost problems, were within a ¾-cent variation, while the nonmembers were within a variation of five to 15 cents.

"There is absolutely no price maintenance in this plan," Mr. Carter said. "We stop at cost. There is still competition among our members, but it is fair and honest and sound competition. It is based on efficiency."

He regarded comparative costs reports as highly valuable, and stated that in his own foundry they had saved $5000 a year on cleaning cost alone.

D. R. Wilson, Wilson Brothers Foundry & Machine Co., Pontiac, Mich., chairman of the committee on foundry methods, reported that a series of papers on methods of sand blasting castings would be distributed to members within the relatively near future. A feature of discussion on foremanship training was an illustrated address by L. A. Hartley, association director of industrial education. He described measures employed with considerable success at the Frigidaire Corp., Dayton, O., and the Ohio Brass Co., Mansfield, O. Here the foremen were first put through a special training of a year or so, and then, in substance, called upon to keep a check on their men on the following questions: (1) Willingness to follow instructions, (2) cleanliness and orderliness, (3) care

of property and materials, (4) ability to work well from whistle to whistle, (5) dependability, and (6) ability to work well with others.

The foreman reports on these questions, but the workman always has recourse to the personnel head if he believes injustice has been done. Then there are questions as to whether the workman owns his own home, or is buying one, or has a saving account and questions as to how many he supports, etc. These are all designed to bring about a happier living condition and, in turn, a more efficient and well satisfied workman.

John Alden Grimes, treasury department, Washington, urged the association to make depreciation studies in co-operation with the bureau of internal revenue. He asserted that such depreciation studies would rebound to the advantage of the government and companies alike.

Use Special Flask in Stove Shop

IN THIS age of mass production, many methods are used to increase the volume of work per man yet not make this increase burdensome to the individual. At the Harvard avenue plant of the Cleveland Co-operative Stove Co., a flask is in use which tends toward this end. It is so designed that it eleminates a straight line lift on the cope which renders the work less strenuous and tends toward increased production.

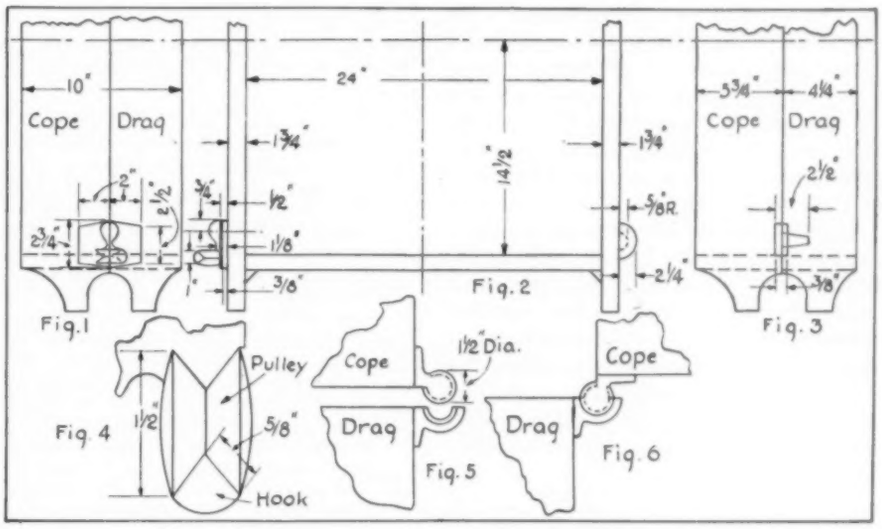
The two parts of the flask are hinged together by two hinges, one at each end along the long dimension. Each hinge consists of a hook-shaped piece whose cross section resembles the segment of a circle. This is shown in Figs. 4 and 5, and is located on the drag side of the flask. On the cope side is placed a circular piece 1½ inches in diameter and 1 inch thick resembling a street car pulley, as shown in Figs. 4 and 5. This latter piece is rigid and has a V-shaped groove ⅝-inch deep into which the drag half of the hinge fits. When the cope is lifted as is later explained. the circular piece drops upon the hook and the cope rotates above the far edge, the side nearest the molder swinging upward through an angle of 90 degrees.

A complete description of the molding operation will clarify the method of using the flask. This type flask is used on matchplate work in floor molding where the castings made are thin in section. The molder places the two parts of the flask together in the proper position, places the matchplate in the flask, shakes on some parting compound, riddles on the facing sand, fills and rams the drag, strikes it off, clamps it, and rolls it over. The operations for the ramming of the cope are practically the same.

In lifting the cope, two small, thin wedges are placed between the matchplate and the cope lifting the back edge about ¼-inch. The edge of the matchplate is rapped lightly and the cope swung upward on the hinges through an angle of 90 degrees, the round part of the hinge dropping on and rotating on the hook. A small rod about 6 inches long and sharp at both ends is placed with the lower end resting firmly and the other end supporting or acting as a prop to hold the cope. This keeps the cope in position. The molder then makes the necessary repairs to the cope and proceeds to draw the matchplate from the drag.

As when lifting the cope, the molder places the two small thin wedges between the matchplate and the drag at the back edge of the flask. He then raps the plate and lifts it. After the drag repairs are made the mold is ready to close. This is accomplished by swinging the cope downward, the cope pins on the forward edge passing through the guide-holes in the lug, and the mold is clamped. Then it is ready to pour.

This flask has reduced the amount of labor involved in making the mold as it avoids lifting and replacing the cope. It has also reduced the time necessary to make a mold and has increased the number of molds made per day.



FIGS. 1, 2 AND 3—REAR, PLAN, AND FRONT VIEWS OF THE FLASK RESPECTIVELY
FIG. 4—DETAIL PLAN VIEW OF THE HINGE. FIGS 5 AND 6—CLOSED AND OPEN POSITION OF THE HINGE

Recondition Patterns

Question: How are metal patterns cleaned and maintained in a condition that will prevent the sand from sticking to them.

Answer: Where the cast iron pattern has become rusty or rough from any cause, it may be cleaned by any of the regular methods available for the purpose, with a file and scratch brush, in a tumbling barrel or under the sandblast. Afterward it is slightly warmed and while in that condition it is painted with melted wax. This coating is polished later with a fairly stiff bristle brush, known in foundry parlance as a *hard* brush to distinguish it from the brush employed to remove dust or loose sand from a pattern or mold surface and known as a *soft* brush. Formerly beeswax and bayberry wax were employed extensively for the purpose, but in recent years a composition wax has been placed on the market and may be secured through practically all foundry and pattern shop supply houses. Aluminum and brass patterns usually require no protective coating with the exception of a little coal oil or gasoline sprayed on them at intervals or rubbed on with a brush or handful of cotton waste. Hot sand and wet sand will stick more or less to a cold pattern irrespective of how it is coated. In many instances a gently warmed pattern has worked perfectly, where former efforts, depending entirely on a smooth surface have failed to give good work.

QUERIES ON FOUNDRY PRACTICE

Suggested Solutions for Common and Unique Shop Problems

Facing Is Responsible for Smooth Skin

QUERY

We have noted that the castings coming from several outside foundries have a smooth light blue skin. Is this due to the sand or the facing? Is it feasible to produce semisteel castings 100 to 200 pounds in weight in a cupola running on ordinary gray iron. What kind of material is used and how is it charged?

ANSWER

The smooth blue skin on gray iron castings is produced by the use of sea coal facing, a refractory sand and a good grade of blacking. The sand must be reasonably fine depending on the weight of the casting. Semisteel is melted in the same manner as gray iron. For ordinary castings the charge is made of pig iron and scrap in the usual proportions, approximately 35 per cent pig iron and 65 per cent scrap. The required amount of steel is substituted for a corresponding amount of scrap. The metal must be melted extremely hot to insure a thorough mixture. Expert cupola practice is an absolute essential to success.

Roll Chill Iron Stands Severe Service

QUERY

Are roll chills made from cast iron in the United States? If so, could you give me the analysis of the iron used for this purpose.

ANSWER

Chills which constitute the body part of the mold in which mill rolls are poured, invariably are made of cast iron of a suitable composition to withstand a maximum amount of alternate expansion and contraction. In other words the composition parallels closely that of ingot molds. The sulphur and phosphorus are held to a low point, the manganese is fairly high and the silicon content varies according to the thickness of the casting. The aim at all times is to secure an iron with a close grain to present a smooth face when machined. The casting is machined on the inside, also on the top and bottom to insure an accurate fit for the sand molds of the necks. If more than one section is needed the joint between the sections must be tight to prevent entrance of any air current.

No definite standard has been established for the thickness of the chill in relation to the diameter of the roll. Individual roll shops have their own standards based on experience and on local conditions. In a general way it may be stated that a thickness of 2 inches is about the minimum even for small rolls 4 inches in diameter. That is a ratio of 2 to 1. This ratio gradually is increased to 2 2/3 to 1 for a 30-inch roll.

Slow Down Melting Speed

QUERY

If we line our 66-inch cupola down to 48 inches do you think we can reduce the melting speed to less than 3 tons per hour. We are melting rolls of wire and other bulky material for sash weights and we want to charge the material without cutting it into small pieces. At present we are using a 27-inch diamcter cupola with fair results but we have to reduce the scrap wire to small sections and charge the cupola carefully. If it is practical to use the 48-inch cupola at a speed of 2 or 3 tons per hour we will use steel wire 40 per cent and stove plate scrap 60 per cent. The metal has to be melted exceedingly hot.

ANSWER

A high steel mixture must be melted at an exceedingly high temperature to insure fluidity. To secure a high temperature the cupola must be operated at a comparatively high speed and high speed naturally will result in high production. The average melting speed for a 48-inch cupola is between 9 and 10 tons per hour. It is out of the question to slow it down to 2 or 3 tons in the same period of time. With a minimum blast pressure of 6 ounces and light charges of coke and iron, say about 1000 pounds of iron to 200 pounds of coke you can reduce the melting speed to between 6 and 7 tons per hour, but that is about the limit. A cupola lined to 36 inches with iron and coke charges of approximately 500 pounds of iron to 80 pounds of coke will serve your purpose more satisfactorily. A fan capable of delivering 1500 cubic feet of air per minute at 5 or 6 ounces pressure will insure a melting speed of between 2 and 3 tons per hour at a suitable temperature.

Layout for Stove Plate Molding Floor

QUERY

We are preparing to make some of our larger stove plate castings in 20 x 27-inch cast iron flasks on a pair of squeezer machines mounted on wheels and located on either side of a long sand heap. One machine will make copes exclusively and the second machine will produce the drags. The molds will be closed in successive lines across the floor commencing at the front and the machines will be moved backward to accommodate the rate of consumption of the diminishing sand pile. We shall appreciate your comment on the proposed method.

ANSWER

The method you outline has the merit of simplicity with no capital outlay for equipment outside that involved in a complete set of flasks. As a constant reader of THE FOUNDRY we assume you have seen the various descriptions of foundries in which continuous methods prevail and in which a comparatively small number of flasks is used several times each day. The molds are assembled and poured while in transit on conveyors. Usually these molding installations are served by elaborate sand handling and conveying equipment. From our former knowledge of your plant we realize that the present method has been adopted to meet local conditions and in our opinion will prove eminently satisfactory for your class of work.

Merely as a contribution to your general knowledge you will be interested to learn that one of the oldest stove foundries in this country recently abandoned the old plant and erected a new foundry that is absolutely the last word in construction, methods and mechanical equipment. The inside is patterned after the new automobile and radiator shops in which metal is poured continuously all day and where the molds travel on conveyors from the molding machines to the pouring station and then to the shakeout. The sand is all taken aloft and tempered and then returned to the hoppers over the various molding machines. The cost of this plant is given as $1,500,000, and the company expects to save enough in production costs to pay for it in less than two years.

Charging Cupolas Mechanically

In Modern Furnace Practice a Tendency May Be Noted Toward Direct Movement from Stockpile To the Cupola Without Placing Materials on the Charging Floor

By John Allen Murphy

A RECTANGULAR yard is served best by an overhead traveling or transfer crane. A yard of irregular shape can be served to the best advantage by a transfer crane with a cage controlled hoist. This hoist can leave the transfer bridge and cover irregular areas on spur tracks as illustrated in Fig. 1. One cage controlled hoist can also serve two adjacent transfer crane bridges, as shown in Fig. 2. This was a triangular plot of ground with the cupola house projecting well out into the yard, making one crane runway considerably shorter than the other. The 4-ton cage-controlled hoist with the magnet operating over two transfer bridges and spur tracks, can unload and place in storage 350 tons of pig iron a day.

Where the cupola house is located at the side of the foundry yard, either a transfer crane combination or an independent yard crane can be employed. With a transfer crane, the cupola-charging hoist can pass over connecting spur tracks, leading to each cupola. If a standard type cage controlled crane is used, the cupola-charging hoist can pass over the traveling crane and serve the cupolas by switches and spur tracks, or where a number of cupolas are in line, it can run upon a transfer crane which travels directly in front of the cupolas. The hoist then can charge the cupolas directly from the transfer crane.

A cupola house located at the extreme end of a long yard, is served best by an independent traveling crane and cupola charging hoist. The traveling scale car can be used to link the crane operations with those of the charging hoist.

With the cupola house located in the center of the foundry buildings, and yard and charging operations carried on separately by a system of curves and switches, the cupola charging hoist will link up these operations.

This is the second and last article by Mr. Murphy describing the equipment which now is used to charge cupolas.

In laying out the yard and charging equipment, the plan should take into account anticipated growth of the foundry over a number of years and provide for increased production.

At first only one unit of the contemplated system, one designed to secure the greatest savings, may be installed. After economies effected have paid for this initial outlay, another unit of the system can be added. Accessories, including storage bins, gravity storage bins for filling the buckets, traveling weighing cars, or auxiliary lift trucks, can be installed at a later date, but all should be put into the plan for later installation before any unit is purchased.

The market for certain types of castings is so dependent upon fluctuations and changes in demand of the industry, that fixed charges must be kept down. An installation should be able to pay for itself from the economies effected in from 9 months to a year. Manufacturers whose products have been in steady demand for years and who expect a continuation can make a more elaborate installation.

Storing materials on the ground level will save rehandling costs and the totally unnecessary expense of constructing elaborate and massive cupola buildings. Materials are carried in charging buckets from ground level storage direct to the cupola.

The present system of bucket charging permits the use of a deep-well cupola, without need for any cumbersome paraphernalia. The charging bucket eliminates the former heavy cupola-house floors and makes it possible to operate with a small, light-construction floor, which can be built for less than one-tenth the cost of the old-fashioned floor. If a cage controlled hoist is used the operator is protected from the elements and only a light roof is required.

Formerly many foundries stored coke in hoppers located above the charging floor. The hopper was filled by a conveyor which carried the coke

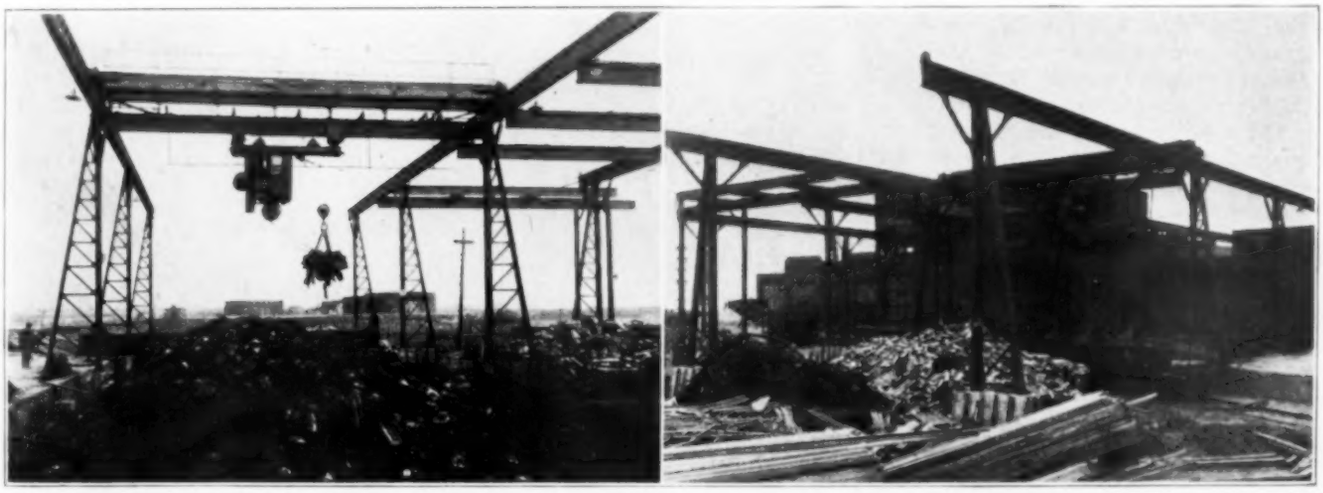


FIG. 1—THIS HOIST CAN LEAVE THE TRANSFER BRIDGE AND COVER IRREGULAR AREAS ON SPUR TRACKS. FIG. 2—ONE CAGE CONTROLLED HOIST SERVES TWO ADJACENT TRANSFER BRIDGES

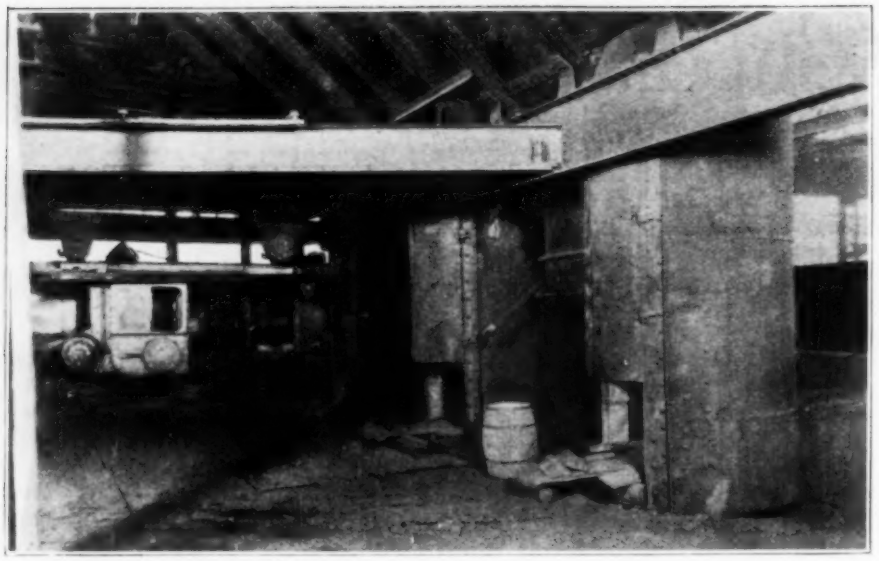


FIG. 3—THE BUCKET SYSTEM REPLACED THE OVERHEAD COKE STORAGE HOPPER

from a pit beneath the railroad siding where the coke was dumped from a car. Coke was dropped off the end of the conveyor into the storage hopper. From the hopper it was dropped through chutes to the charging floor. The coke was then forked into the cupola by a laborer. This treatment added to the cost of operating a foundry, also crushed the coke to such an extent that it lost considerable of its heating power.

The old-fashioned coke hopper systems in one foundry and shown in Fig. 3 was abolished as soon as the bucket system was introduced. Coke is unloaded by a motor operated electric grab bucket, directly from gondola car to gravity storage bin, then raked into the charging bucket. The electric motor grab bucket is light and closes by electric power under precise control and does not crush the coke.

Materials for the cupola charge can be kept on the ground, in storage bins, or in some type of gravity bins, depending on the size and shape of the foundry yard. Only sufficient gravity storage bins need be built to provide enough material for filling the bucket on a scale car.

Charging buckets are filled from gravity storage bins, in a pit to which the materials are brought, on a push type scale car running on a depressed track adjacent to the storage piles. The particular method adopted by any foundry depends on local conditions.

Where a single transfer crane charges and unloads materials and where the buckets are filled from gravity storage bins, these bins must hold material required for at least one day's heat. Where an independent yard crane unloads material, the gravity storage bins need hold only enough charging material for a couple of hours' operation. The bins can be replenished, without interrupting the charging schedule.

The traveling scale car can be equipped with a multibeam scale. Each beam carries weights corresponding to the amount of each ingredient to be charged. Two laborers stand on the scale car, one on each side of the bucket. One laborer runs the motor driven car in front of the bin and pulls down the scale beam corresponding to that bin.

A lip on the bin projects about 11 inches over the edge of the bucket. Both laborers rake the material from the bin into the bucket until the beam on the scale car makes a floating contact with an electric bell. This starts an intermittent ringing, a signal to rake smaller amounts of material into the bucket until a continuous ringing of the bell signals that the correct amount of that ingredient has been loaded. The laborer then runs the car to another bin, and the procedure is continued until all the required ingredients have been placed in the bucket. The cupola charging hoist then lowers an empty bucket upon the scale car and picks up the filled bucket.

The gravity storage bin house can be heated in winter which not only make it comfortable for the laborers engaged in filling the buckets, but also tends to preheat the material to some extent before it is placed in the cupola. In any event, all ice, sleet and moisture are removed from the material.

In small foundries the scale car can be employed without the use of gravity bins. The scale car can operate on a depressed track and the laborers pick the materials from adjacent piles on the ground and drop them into the buckets. Absolute accuracy is obtained in making up the charges. The weights on the scale beams can be set by some responsible person and a change can be made at any time without explanation to the laborers. They simply listen for the bell, where the scale beam is electrically connected.

Gravity storage bins are filled through hatchways in the roof by a magnet for metal or a grab bucket for coke and limestone. A locomotive crane, or roller or portable conveyors also can be used. Hatchways preferably should be located adjacent to the railroad sidings. Under favorable conditions the bins frequently can be filled directly from gondola cars without reclaiming the material from storage piles in the yard.

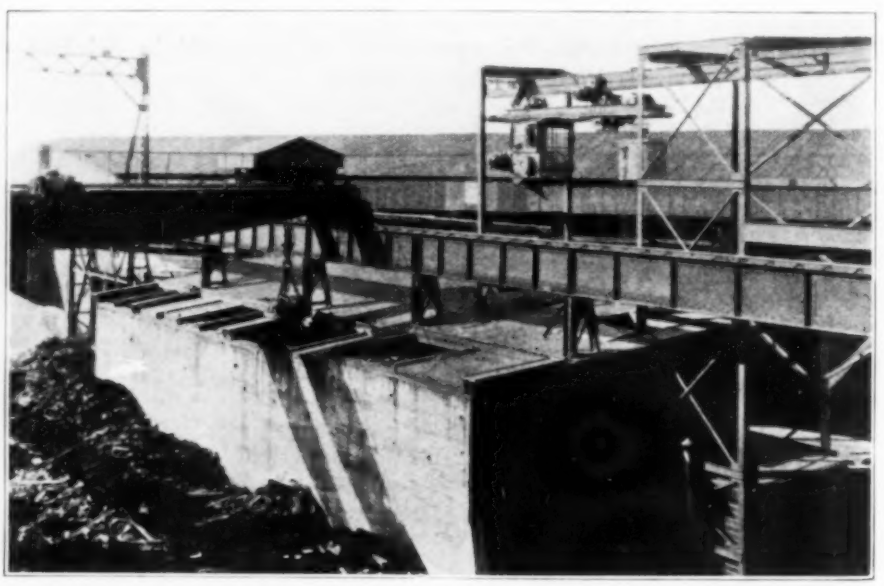


FIG. 4—AN INDEPENDENT CAGE CONTROLLED CRANE IS USED TO FILL THE GRAVITY BINS WITH PIG IRON, SCRAP AND COKE

The FOUNDRY Family Photograph Album

Upper Left

DAVID EVANS

Chicago Steel Foundry Co., Chicago

Lower Left

H. L. McKINNON

C. O. Bartlett & Snow Co., Cleveland

Upper Right

FRED ERB

Erb-Joyce Foundry Co., Detroit

Lower Right

F. M. DEVLIN

Philadelphia Hardware & Malleable Iron Works, Philadelphia

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

NONFERROUS METAL SPECIFICATIONS

(*Continued from Data Sheet No.* 744)

General Information: The tensile strength of test-specimens about ½-inch diameter of this alloy cast in sand and tested without machining off the skin should be about 19,000 to 23,000 pounds per square inch and the elongation will be practically nothing.

The specific gravity of this alloy is about 2.95 and a shrinkage of 0.156 (5/32)-inch per foot should be allowed in pattern designs. This alloy is used for manifolds, pumps, carburetors, cylinders and other parts which should be free from leaks and where the brittleness of the alloy is not objectionable.

Specification No. 33, *Aluminum*

	Per Cent
Aluminum	88.00 to 92.00
Copper	6.00 to 8.00
Zinc, max.	2.50
Iron, max.	1.50
Silicon, Manganese and Tin, max.	0.75
Other Impurities	None

General Information: The tensile strength of test-specimens about ½-inch diameter of this alloy cast in sand and tested without machining off the skin should be about 19,000 to 21,000 pounds per square inch with elongation of 1 to 2 per cent in 2 inches.

This is a light alloy having a specific gravity of 2.83 to 2.86 and is used extensively in the automotive industry. A shrinkage of 0.156 (5-32)-inch per foot should be allowed in pattern designs.

This alloy is similar to Specification No. 30 and is used for crankcases, oil-pans, steering-wheel spiders, differential carriers, transmission cases, camshaft housings, hub-caps and similar parts.

Specification No. 34, *Aluminum*

	Per Cent
Aluminum, min.	87.00
Copper	9.25 to 10.75
Iron	0.90 to 1.50
Magnesium	0.15 to 0.35
All other elements, not over	0.75

General Information: Test-bars cast in a chill mold show a tensile strength of 24,000 to 30,000 pounds per square inch and the elongation in 2 inches is usually less than 1 per cent. The specific gravity should not exceed 2.95. The brinell hardness number, using a 500 to 1000-kg. load with a ball 10 millimeters in diameter, should be not less than 85 and should average about 105.

(*Continued on Data Sheet* No. 746)

NONFERROUS METAL SPECIFICATIONS

(*Continued from Data Sheet No.* 745)

This alloy cast in permanent molds is used principally for pistons, camshaft bearings, valve tappet-guides and other parts where high hardness and good bearing qualities are essential.

Specification No. 35, *Aluminum*

	Per Cent
Aluminum, min.	92.50
Copper, max.	0.60
Iron, max.	1.00
Silicon	4.50 to 6.50
Zinc, max.	0.20
Manganese, max.	0.20

General Information: The minimum tensile strength of test-specimens about ½-inch in diameter of this alloy cast in sand and tested without machining off the skin, should be about 16,000 pounds per square inch with a minimum elongation of 3.5 per cent in 2 inches.

This alloy is intended for automobile body parts and other parts that must be cast in thin sections. The alloy withstands salt-water corrosion well and therefore is suitable for aircraft engine parts or other parts that may be subjected to severe corroding influences. The alloy has a relatively low yield-point and therefore cannot be used where great strength or stiffness is required.

Cast Brass Alloys

Specification No. 40, *Red Brass*

	Per Cent
Copper	83.00 to 86.00
Tin	4.50 to 5.50
Lead	4.50 to 5.50
Zinc	4.50 to 5.50
Iron, max.	0.35
Antimony, max.	0.25
Aluminum	None

General Information: Good castings made of this alloy should give the following minima in physical characteristics:

Ultimate strength, pounds per square inch	27,000
Yield point, pounds per square inch	12,000
Elongation in 2 inches or proportionate gage length, per cent	16

This is a free-cutting brass with good casting and finishing properties.

(*Continued on Data Sheet No.* 747)

How and Why in Brass Founding

By Charles Vickers

Core Causes Trouble

We experience considerable trouble in casting bronze bushings about 24 inches long, 14 inches inside diameter and ¼-inch thick, the difficulty being irregularly-shaped holes which appear most generally on the inside of the casting after machining. We also make bushings one-half the above size and the singular thing is these always come clean and sound, even when poured from the same heat of metal as a large bushing. The mixtures we use are copper 85, tin, lead and zinc 5 per cent each; and copper 87.50; tin 7.5; lead 2.5, and zinc 2.5 per cent. The metal is melted in coke-fired furnaces with charcoal as a covering. The cores are of Michigan City sand bonded either with oil or proprietary binder, usually 50 to 1 for either binder. We use no pyrometer on the metal but judge the temperature by eye. We send a small sample cut from a bushing to better illustrate the defects.

The fact that the smaller bushings are sound even when poured with metal of the same heat as the large bushings, and the latter are not sound indicates that the source of the holes lies in the large mold. Something is wrong with these molds, because while the metal before being poured into them is in good condition and capable of making satisfactory castings, it comes out of the mold as a gassed casting.

Seeing that the metal seems to have no quarrel with the green sand comprising the mold, but lies against it quietly, as evidenced by the smooth finish of the outside of the bushing, suspicion is directed toward the core, but there is nothing wrong with either the sand or the binders used for that core, and this directs attention to the manner in which the core is made. We, therefore, call your attention to the following items: (1) Are you trying to make these large cores minus vents? If so we will state that it cannot be done as a paying proposition. (2) How much further are the vents in the larger core away from the core circumference, than they are in the smaller core, assuming that the larger core is vented?

If the coremaker is taking for granted that the hot metal will force the gases it generated at the core surface through an indefinite thickness of core structure, it will do no such thing. It requires pressure to force gases through a core substance, and the pressure increases with the distance they have to travel, so when it reaches the point where it overcomes the pressure on the molten metal the gas blows out at the core surface and displaces the metal. As the metal sets, the gas from the core surface forms bubbles extending into the metal, the result being a spongy casting. This is one cause that will bear investigation. Also the same thing occurs when blacking is used against which the metal has some objection. So try a few castings without blacking; we are merely guessing about this being used. As we do not know how the bushing is poured, little can be said on the subject, but we would suggest the large bushing be so gated that the metal has no further to travel than in the case of the small bushing.

Suggests Manganese

We are experiencing some trouble in making a cone-shaped casting about 4½ inches in diameter, 3½ inches high, with a 2-inch core extending into the casting for about 1¾ inches. The specifications call for 90 per cent copper and 10 per cent tin, no lead or zinc. We tried pouring these castings without using any flux, but they were porous. We then added some phosphor copper and the castings seemed to pour all right but the metal boiled back out of the sprue and left the castings all spongy and porous. We then tried a flux which contained some nickel and magnesium and the castings were all right on the bottom, but porous on top. The metal looked sluggish when pouring, and the top of the castings looked as though they were full of slag. We have made several thousand of these castings of the following mixture: Copper, 89 per cent; tin, 7 per cent; zinc, 4 per cent, and lead, 0.25 per cent, and have never had any trouble with them. We would appreciate it very much if you could suggest a way of pouring these castings with a 90 and 10 mixture so as to overcome the porosity in the castings.

In spite of the fact that the heat of formation of the *ous* oxide of tin (SnO) is much higher than that of cuprous oxide, being for the tin 70,700 calories against 43,800 calories for cuprous oxide, and that therefore, the tin ought to deoxidize the copper and thus give sound castings, we know only too well that it does no such thing. It may deoxidize all right but it never insures sound castings. Also while phosphorus often can be relied on to promote soundness in the absence of zinc, it sometimes falls down too, as in the present case. However, we have made 90-10 sound with phosphorus, in fact a phosphorized alloy of this composition is a standard phosphor bronze well known and valuable. The alloy though is made better by using 5 per cent phosphor-tin and 5 per cent Straits tin, than with all Straits tin and phosphor copper.

Magnesium-nickel is not a good combination and those responsible for it probably never carried out any research work with magnesium alloys. When properly combined with other so-called deoxidizers, magnesium can be induced to give excellent results but alone, it is a gay deceiver with most nonferrous alloys. This includes nickel and its alloys also, notwithstanding all that has been said and published on the subject. Properly combined magnesium gives infinitely better results than when used alone, and these matters the writer has discovered by actual research with these elements and casting the treated alloys in sand molds, not chill molds, which give misleading results. The lesson that work with deoxidizers teaches is that the effect reached is not due to actual deoxidizing but is akin to the influence of sodium on aluminum-silicon alloys, and the word *modifying* would fit the case best.

The best way to modify a 90 and 10 alloy is to deduct 0.5 per cent from the copper and replace it with 0.5 per cent of manganese-copper, containing 30 per cent manganese and low iron. The alloy becomes 89.50 per cent copper; 0.50 per cent manganese-copper; 10.00 per cent tin. Melt the manganese-copper with the copper part of the charge under charcoal if a coke-fired furnace is used. After the tin is added superheat the metal until considerably hotter than the pouring temperature, this is the *killing* period. Cool down for the mold. This method can be depended upon to give sound castings free from porosity.

Bill Delves Into Production Cost of Castings

By Pat Dwyer

WHILE rooting around in a drawer the other day I came across a letter from an old friend in Florida. It (the letter) arrived one day last winter—maybe it was the winter before last—they all look alike in retrospect—anyway, I remember it arrived on an exceedingly cold day and accentuated the envy I felt at his description of boating and bathing, fishing and lying around in the warm sand. The letter was written on the most exclusive kind of paper, flaunting the name of the hotel at the top in a kind of a coat of arms surmounted by a crown and bearing a representation of a full rigged ship silhoueted against a rising—or setting—sun and with a large seagull flying out of the lower left hand corner.

I puzzled quite a bit about the significance of this heraldic device and finally decided it was emblematic of the tourists who patronize this hostelry in the winter season. They arrive like a full rigged ship loaded down with bales of filty lucre and they depart like the seagull, stripped down to the bathing suit. The crown at the top of the device undoubtedly is a kind of trophy, a delicate tribute, probably awarded annually to the hotel with the longest and most thoroughly cleaned line of guests.

All this is the most idle surmise on my part. I never visited Florida. In my young and touring days the state offered no inducement. In those days, even as at present, I had to work to eat and the law of self preservation guided me into territories where foundries flourished in bunches, or failing that, within reasonable distance of each other. In later years I have been—er—prevented from visiting this playground of the idle rich. From a perusal of my friend's letter I gathered that the place presents certain advantages and—disadvantages. He wrote:

Florida sometimes is called the chin whisker of the United States. It is much larger than I thought. It is 600 miles long, 250 miles wide and has an elevation of 3 feet, no inches. The state is bounded on the north by the eighteenth amendment and on the other three sides by the 3-mile limit which makes business good for the bootleggers and helps to reduce the price of hooch. You can get *Johnnie Walker* or *Haig & Haig* for $6 a quart. Choice stuff comes here from Canada and Bonnie Scotland via the Bahamas and Bermuda.

Florida is inhabited by Indians, Americans, white men and feed-bag tourists, sometimes known as *tin-canners*. The reds live on the everglades, the blacks live on the whites, the whites live on the tourists and the tin-canners live on the municipal camping grounds. The principal sources of income are: Hotels, fruits, alligator and tourist skins. The place has the best press agents east of California. Orange raising is popular. If you have enough money to buy the land and the trees, if you can live until the trees mature and if you can sell the oranges before the frost gets 'em, you are all set.

He wound up his letter by reference to a birthday party tendered A. C. Dinkey, president of the Midvale Steel Co. A. C. served his time in the old Pittsburgh Locomotive Works machine shop at the same period Ben was serving his time in the foundry. Each of the guests contributed a card of a felicitous character. Ben dashed off the following little gem of poesy which shows that he is as nimble with the pen as he ever was with the shovel and rammer:

They say that a man is as old as
he feels,
That being so we think we
Can guess your age as about twenty
four,
Perhaps a bit less; but not any
more.
For that's how you feel, Mr. Dinkey.

* * *

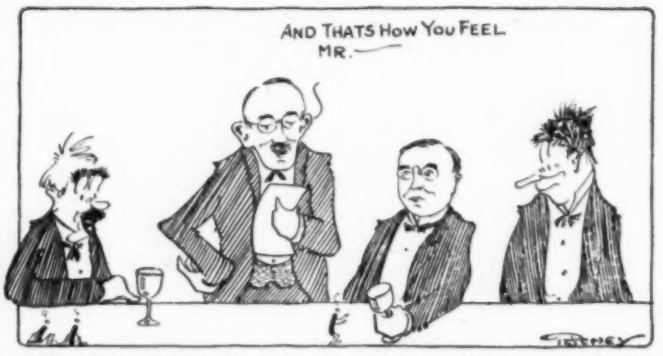
We hope that you may never grow
old;
Lose the shine from your eye so
twinkey.
Always keep the smile that won't
come off,
May you dodge Father Time, his
growl and his cough.
Yes! That's what we wish, Mr.
Dinkey!

Discovery of this letter led me to search farther and I was rewarded by finding the following copy of the letter I sent to him in reply.

Dear Ben: It was quite the fashion many years ago for all the bo's to follow the swallow and fly South for the winter season. I have hobnobbed with many of them on their return and have been regaled with descriptions of scenery, living and working conditions, and the opportunities presented for whiling the happly idle hours away.

These virile and sturdy citizens drank and fought their way down through the Carolinas, Georgia, Alabama, Mississippi and Louisiana and then north again through Texas, Arkansas, Missouri and Illinois to the industrial section in the vicinity of the Great Lakes. Naturally on a round trip of that kind they enjoyed many peculiar experiences. However, like everything else, I see that touring fashions are changing. Basking on the beach! Quotha. Dabbling in the surf, playing golf, attending birthday parties and then, mind you to crown it all—WRITING POETRY! God help all poor molders after this. Certainly they will have to keep out of Florida. Ability to drink beer, eat fried chicken, hop the rattlers and dodge the dicks may be acquired, but writing poetry is a gift vouchsafed to only a favored few of the crowd.

When Bill came in the other night I remarked how easily these foundrymen write when they have the time and the inclination. "Well," said Bill, "I'll tell you. It depends on what they



INSPIRATION FROM PONCE DE LEON'S FOUNTAIN OF YOUTH

are writing about. You ought to see some of the letters I get from people engaged in other lines of business who want to get some inside dope on the foundry. The hopeless feature of this kind is that the person making the inquiry knows practically nothing, or next to nothing of the foundry industry. Knowing nothing of it he assumes that the business is the essence of simplicity and that he can get all the information he wants by asking a few leading questions. He sits down at his desk, calls in his trusty stenographer and says: 'Here take a letter to this here guy Bill what's-his-name, you know the fellow I mean, lives in Cleveland, I forget the address, look it up in the telephone directory, or in our files. We had some correspondence with him before. Bill—Bill—Oh, never mind, I'll think of it later. Just say: *Dear Sir:*—No, I guess that is too formal. Just say: *Dear Bill*—I know the name but I can't think of it—let it go—lesee—er—ah—*Dear Bill*—I hope he does not think I am too familiar—*Dear Bill*—I wonder if I had not better make that *William?* Let 'er go as is.

Dear Bill: We buy a lot of gray iron castings and I should like to make an intelligent check-up on the prices. I shall appreciate your opinion on this—ah—proposition and to conserve your time and mine—I think that is a pretty good touch—*I'll draft the inquiry in the form of a few definite questions.* Period. Paragraph. Enclose the following numbers in brackets.

(1) *What is the cost of making gray iron castings?* (2) *I should like a summary and also detail on several features, for example*—what's this number three? All right then (3) *amount of coke required to melt a ton of iron* (4) *amount of pig iron in the melt* (5) *metal loss in melting the iron* (6) *cost of sand, etc.*,—that's seven isn't it? (7) *the cost of molding an average casting.*

" 'I guess that sums the whole thing up pretty well and when I get Bill's reply I can talk turkey to some of these birds who think I am an easy mark. I'll show 'em. I may not be back this afternoon. Just sign that in the usual manner and have it sent out with the rest of the mail.'

"That's the precious letter that comes to me," said Bill, "and although I am as willing as the next lad to rally around and hand out information, I find that I have a limit. I don't mind giving a person a yes or no answer, or even to expanding on this yes and no occasionally, but I have neither the time nor inclination to write a book, and certainly nothing less than a good fat book could begin to do justice to that list of questions.

"In my reply I pointed out to this lad that individual conditions vary to such an extent that general or average figures on cost of producing gray iron castings are only of academic interest. Interesting as statistics but of no practical use. All the foundry cost of producing the castings may be included under three main headings, labor, material and general expense known as overhead.

HALF AND HALF BECOMES 100 TO 1 SHOT

"Each and all of these factors are subject to wide variation and when considered in their almost infinite subdivisions, present a peculiar problem that only may be solved by considering each foundry by itself. The greatest variation, of course, obtains between foundries located in widely separated parts of the country, but any person who investigates the subject will be surprised at the variation that exists in the cost figures of two apparently identical foundries in the same territory.

"The subject, I explained, is far too extensive to be covered in a brief review. To convince him on this point I submitted the following direct replies to his list of questions, taking them in the order of presentation. The answers are direct, straight from the shoulder kind he expected to his snappy questions, but he can't apply them to his problem.

"1—The cost of making iron castings ranges between 2 and 25 cents per pound, 2—This cost includes every expense incurred for labor, materials and overhead, 3—In some foundries iron is melted in the proportion of 10 tons of iron to one ton of coke, while in other foundries the proportion is 1 ton of coke to 5 tons of iron. 4—The amount of pig iron entering the charge varies from none to 100 per cent. 5—Metal melting loss varies from 1 to 20 per cent. 6—Cost of sand where the foundry is close to a sand supply may not run over $1 per ton. In remote localities the cost may run up to $15 per ton. 7—Cost of molding the average casting is 1¾-cents per pound, based on an average wage of $7 per day and an average daily output per man of 400 pounds.

"All the foregoing answers are accurate, short and specific as far as their relation to the various questions is concerned, but they are of no direct value to the man in coming to a conclusion whether he should enter the foundry business, or continue buying his castings as at present from some dependable foundryman. The questions and answers simply represent a waste of time on his part and on mine. Facts and figures are handy things, but they are about as much use to the man without a fundamental or basic knowledge and background, as a set of any kind of tools is in the hands of a child or of a man who never has handled them before. Also they are just about as dangerous. Sharp tools cut the fingers of the inexperienced and stray statistics lead the unwary into many pitfalls.

"Of course, as I said in the first place, practically every person on the outside thinks the foundry business is only a kind of a kindergarten. Nothing to it. All the foundryman has to do is take a pattern, make an impression of it in the sand, fill the impression with molten metal and then sell the casting at an exorbitant price. Hence the first question on the list. If he had not been hampered by tradition and custom of correspondence convention he would have written: 'Just between ourselves I wish you would give me the real low down on this here casting thing. What does it actually cost to produce an ordinary gray iron casting?'

"The funny thing about it is that he actually expected me to give him a definite figure when he might just as well have asked me how long is a piece of string and expected me to say 6 inches. A summary and details of a cost system advocated for adoption by the American Foundrymen's association was published in THE FOUNDRY in 1920 where it ran

through three issues, and covered nearly 20 pages, mostly in 6-point type. This inquirer remarks nonchalantly, 'Lemme have a summary of what it costs to make a casting, will yah? He is not satisfied with a summary. While I am on the job I might just as well forward a few details. He wants to know how much coke is required to melt a ton of iron. Under exceptionally favorable circumstances iron is melted in long heats in the proportion of 200 pounds of coke to 1 ton of iron. Where extremely hot iron is required the amount of coke required per ton of iron is 300 pounds. On a 20-ton heat this will represent a difference of one cent per pound in the castings produced where coke is $4 per ton, and where it costs $14. Unless this point is known to the inquirer, what is the use of telling him that iron can be melted in the ratio of 1 to 10? How much pig iron is required to make a ton of castings? This question is worthy of the old lad who said he made his hot dogs from a 50-50 mixture of horse and rabbit meat, one horse and one rabbit! Certain classes of castings are made satisfactorily from mixtures that do not contain even a single pig. Contrast this with castings poured direct from molten pig iron as it comes from the blast furnace and other castings, limited it is true, that are poured from 100-per cent mixtures of pig iron melted in the cupola. The amount of pig iron required, depends on the character of the castings, the price of pig and scrap laid down in the foundry yard, and the proximity of the available sources of supply of these materials.

"A plain, bald statement to the effect that the average machinery casting is made from a mixture of 30 per cent pig iron and 70 per cent scrap conveys no real information to the man who does not know the difference between, basic, bessemer, malleable, No. 1, No. 2 and silvery pig iron. Or between stoveplate, burned grate bars, tin cans, light scrap, heavy machinery scrap, scrap malleable, or old annealing boxes. Pig iron may be pig iron to the outsider and scrap may be scrap, but the results may be astonishing when they are melted. Strychnine is a wonderful heart stimulant, but it is dangerous stuff in the hands of a man whose only knowledge of its properties is confined to a chance remark he has heard to the effect that it is used for this purpose.

"Under ideal melting conditions pig iron and heavy scrap will show a volume reduction between 1.00 and 2.00 per cent. The loss on light scrap may run to 5.00 per cent while the loss on light, rusty or burned scrap may reach 20.00 per cent. Where the iron is melted under oxidizing conditions, the loss is much greater. To this must be added the iron lost through careless pouring, small scrap lost in the cleaning room and in the cupola drop and iron that passes off in the slag.

PATIENT SHOWS LAMENTABLE LACK OF POISE

"Cost of sand as I stated in my reply varies with the locality. However, except in steel foundries, the cost of sand is not a major factor. In steel foundries, new sand usually is used in the proportion of 1 ton of sand per ton of castings produced. The usual proportion of new sand in gray iron and brass foundries is 1 ton of sand to 10 tons of castings. In recent years many foundries claim to have effected substantial savings by the substitution of special clays. Yes, sir, as old what's-his-name said long ago. "A little knowledge is a dangerous thing!"

Sells Sand Machines

The Royer Foundry & Machine Co., Wilkes-Barre, Pa., has sold sand separators and blenders to the Babcock-Wilcox & Goldie-McCulloch Co. Ltd., Galt, Ont., John Bertram & Sons Co., Dundas, Ont., Keystone Driller Co., Beaver Falls, Pa., Peacock Bros. Ltd., Montreal, Que., Reading Car Wheel Co., Reading, Pa., Symington Co., Rochester, N. Y., University of Illinois, Urbana, Ill.

Great Lakes Foundry Sand Co. has moved its Detroit offices to 1356 Penobscot building.

Take Place of Old Sand in Cupola Bottom

Question: Do you know of a suitable substitute for used molding sand in the bottom of a cupola? We operate a permanent mold foundry and do not use molding sand. We have been getting sand from foundries in this vicinity, but have about exhausted our source of supply.

Answer: Up to the present used molding sand has been so plentiful, inexpensive and so well suited to the purpose that no person has troubled to seek a substitute. In fact we doubt if any other material is available. Any kind of sand, new or old will make a satisfactory bottom, but naturally the foundryman has been using the old sand, because it has cost him nothing. In some instances it represents a slight saving, since he utilizes it instead of paying to have it hauled away. We are rather at a loss to understand how you can be approaching possible exhaustion of your sources of supply, unless your custom is to discard all the bottom sand each day and use a fresh supply. This is not necessary. The sand can be used indefinitely. Certainly you may lose a little each day, but that loss is so slight that you should be able to replenish it from the waste sand of even a small gray iron foundry. Instruct your cupola man to rake away the coke and cinder from the drop in the morning. The sand then can be reclaimed and used again. Fine cinder mixed with it will not impair its utility. In fact it will improve its permeability. In the event that your local supply actually is cut off you probably can secure a carload from any one of the large foundries within a radius of 100 miles for the cost of hauling it. Dump it in the yard and it will last you indefinitely. Of course, new sand will answer your purpose, but curious as it may seem it is not so satisfactory as old burned sand. However, after it once has been burned it may be used continuously as previously outlined with the addition of a little new sand each day to make up the loss. A coarse, open sand is best.

G. S. Robins & Co., St. Louis, has been appointed distributor in the St. Louis district for the General Naval Stores Co., 4125 Hamilton avenue, Cincinnati.

Charles Vickers Says—

High Quality Copper Is a Prerequisite

This Is Number Five of a Series of Article on Practical Brass Founding

DURING the course of the present series of articles the importance of using only the best grades of copper commercially obtainable has been stressed a number of times, but the subject is dealt with again because it cannot be emphasized too strongly that the use of impure copper is a sure road to trouble and loss when attempting to produce copper castings of high electrical conductivity. Also it may prove a serious handicap to success in making brass or bronze castings of engineering importance, when rigid specifications for physical properties have to be met. The impurities that ordinary copper may contain may comprise elements, the effect of which is to lower its electrical conductivity, or to reduce its ductility. Obviously then when electrical copper is to be cast the use of ingot of lower than 100 per cent conductivity should be avoided. This is done easily by purchasing a brand noted for its purity and which may contain 99.90 per cent plus copper. As a considerable part of the missing 0.10 per cent will be oxygen, the remainder of the impurity will be distributed among a half dozen or so of elements. Consequently, the amount of each can be relied upon to be considerably below the point at which any of the qualities of the copper would be impaired greatly.

The effect of percentages of arsenic and antimony on the conductivity of copper is given in the accompanying table taken from the Anaconda Copper Co. *Handbook*.

Per Cent Impurity	Conductivity Per Cent Arsenic	Antimony
0.0010	100.6	100.5
0.0050	99.3	99.8
0.0100	97.6	98.9
0.0200	94.5	97.2
0.0300	91.5	95.8
0.0500	87.7	93.5
0.1000	76.2	89.3

This table shows that a considerable handicap would be imposed by attempting to make high electrical conductivity copper castings, using, for instance, a Lake copper containing 0.0062 per cent arsenic, and the utter impossibility of succeeding with a Lake copper running 0.3180 per cent arsenic. Such a copper may have been used in that particular foundry for years in making bronze, and the results obtained with it, difficult to duplicate with any other copper. Lake copper has a deservedly fine reputation for making bronze and for many other purposes also. In European countries fireboxes for locomotives are made largely of rolled copper, and the best copper for the purpose has been found by experience to be arsenical copper. However, for making high electrical conductivity copper castings, arsenical copper is the wrong material to use.

It must not be assumed that all brands of Lake copper contain arsenic as some of them are purified electrolytically and are quite as free of arsenic as the electrolytic copper. Still they may be sold as Lake copper, and therefore, there may arise a doubt as to their fitness for making high conductivity copper castings. This doubt can be set at rest by having a conductivity test made from a sample cut from one of the ingots.

Affects Other Alloys

Copper containing small amounts of antimony and arsenic is also the wrong material for making such alloys as manganese bronze and aluminum bronze, for depending upon the amount present, troubles will develop in making castings. In the case of manganese bronze, the strength and ductility of the alloy will disappear, with considerably under 1 per cent addition of these impurities, while with aluminum bronze the effect of these elements is to lower the physical properties, and also to cause unsoundness. in most brass foundries, the strongly embrittling effect of antimony on aluminized brasses of the 60-40 type is well known. While the latter class of castings are usually *cheap* it should not be assumed that any sort of copper can be used in making the alloy. It will be safe to use wire scrap, or rolled material of any kind in place of cast copper as it is understood that ingot copper is too expensive for such a purpose. Another use for copper of a high degree of purity is in electric welding machines. Of these there are a number of types, and their requirements in the matter of copper parts may vary largely, but some of them use disks of copper which often are forged down from a cast blank. These castings must be made of good electrolytic copper, otherwise they will not forge properly. The loss due to cracking and splitting under the hammer will be so large that the puzzled foundryman parts with a sizable portion of the profits he has made on other jobs in taking the bad ones back and making them over. To make such work so the castings can be depended upon to remain sold, it is only necessary to keep in mind some of the things stated in these articles concerning the embrittling influence of certain impurities that may be contained in copper, and it is certainly advisable to avoid using such copper.

A well known brand of electrolytic copper should be selected for such copper work as may require to be forged after being cast. Such copper is safe to use. It has to be deoxidized, of course after its sojourn in the brass melting furnace, otherwise sound castings cannot be expected. Methods of doing this may be found in earlier articles of this series. Electrical conductivity in the case of such castings is not usually of major importance, but ductility at a red heat is highly important, therefore, freedom from small amounts of lead is desirable. According to Hoffman, *Metallurgy of Copper*, page 19, when this metal is present to the amount of 0.05 per cent in oxygen-free copper it renders it red-short. Also 0.02 per cent bismuth has the same effect, while, with 0.10 per cent antimony the copper cracks at the edges when being rolled.

Arsenic is less harmful for it requires around 1 per cent to cause red-shortness. Sulphur also should be guarded against. This latter element can be absorbed in the brass

furnace from the fuel. When such impurities are present in copper that has to be sand cast and afterwards forged, it is likely that every heat will behave differently due to the varying oxygen content of the copper. This is largely a function of the melting practice for each particular heat, some heats will forge fairly well, and others not at all, according to what reactions have taken place during the melting period. It is necessary, to produce sound and satisfactory copper castings that a foundry be equipped with melting furnaces capable of attaining a high temperature, for the copper has to be brought to a high degree of heat in the furnaces. No greater mistake can be made than to handle copper at the same temperatures as red brass or bronze, the pouring temperatures of which will range from 2050 to 2250 degrees Fahr.

Gives Casting Temperatures

The following interesting remarks were made by Sir Gerald Muntz during the discussion of a paper by Lobley and Jepson, *Journal* Institute of Metals, Vol. 35 (1926), presented at a meeting of the institute. Sir Gerald stated, "The results obtained by the authors of the paper confirmed the results that had been obtained in practice, not only with electrolytic copper, but also with tough-pitch, and all other kinds of copper, with regard to the temperature at which copper should be cast. The experience of most copper manufacturers was that the proper temperature at which to cast copper was about 1300 to 1350 degrees Cent. (2372-2462 degrees Fahr.). That was the temperature to which he himself always made his own people work.

"Below that temperature the air was not got rid of; the copper was sticky and viscid and the air could not get away. On the other hand the copper must not be too hot, otherwise it would take up gases, hydrogen especially. One thing to be watched in casting copper in large quantities was that should the temperature rise over 1400 degrees Cent. (2552 degrees Fahr.), it was desirable to permit the copper to rest a short time in the vessel containing it, before pouring into the final mold, in order that the gases could come off, which they did. This is an important point in the casting of copper."

The above temperatures may seem entirely too high. The size of the castings poured were not given, but this influences the casting temperature for every one knows that it is not necessary to pour a heavy casting, whether copper or bronze, at the same temperature found necessary for small castings. It is necessary to use judgment in selecting the most suitable pouring temperature for copper castings. If the pouring temperature of a similar casting of brass is known, and 100 degrees Fahr. is added to this, for pouring copper, better results will be achieved than by pouring the copper at the temperature used for red brass. The pouring temperature of copper also should be governed largely by the deoxidizer added. The fluidizing effect of phosphorus is such that the copper can be poured at a lower temperature than when silicon is used.

Various high conductivity deoxidizers demand high temperature pouring and one foundry habitually successful in making high conductivity copper, melts in crucibles in oil-fired furnaces and pulls the crucibles at around 2500 degrees Fahr. The pots are cooled to around 2300 degrees Fahr., the pouring temperature they prefer by adding gates. Their operations are attended by *good luck* quite uniformly, and the castings are a most miscellaneous type of copper jobbing, of widely varying weights. Their conductivity must be in excess of 80 per cent.

Results Not Uniform

A second foundry treats the copper in the same manner as the red brass they also make, pouring at a similar temperature as the brass and their *luck* is exceedingly spotty, the scrap pile being well replenished. Their conductivity must be in excess of 84 per cent, and they use the same deoxidizer as the previously mentioned foundry. Thus we note that *luck* and knowledge are often synonymous words. As mentioned before it is important to be equipped with melting units capable of attaining the necessary temperatures. Both crucible furnaces and non-crucible furnaces can be used with the same success.

The two foundries mentioned used crucible furnaces, but a third foundry used the horizontal cylindrical type of oil-fired non-crucible furnaces and successfully turned out thousands of pounds of beautiful copper castings, some of them solid masses six inches and over in thickness, which afterwards were slotted half way through, and they had to be sound to the core. These were also high conductivity copper castings. The keynote of success in both cases, the crucible and the non-crucible methods of melting, was superheated copper in the furnace, and pouring at a higher temperature than is usual with brass. In all three cases the same deoxidizer was used, the amount added also was the same.

Copper can be cast quite readily in metal molds. For large molds cast iron is quite serviceable as may be noted in an article by the author on casting copper in permanent molds which appeared in THE FOUNDRY, October, 1912, pages 415-416. This article describes the casting of copper terminals weighing 70 pounds each with four 2-inch diameter copper cables cast in. These cables were composed of thin copper wires stranded into a rope. It would have been difficult, almost impossible to have made such castings in sand molds, because of the snaky character of the cables, and the difficulty of preventing the thin wires, although well wound at the ends from digging into the mold surfaces. Iron molds easily solved the problem.

Polish the Mold

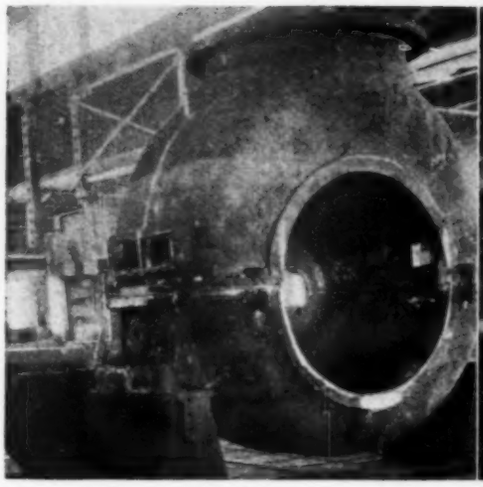
All that is needed for making an iron mold of such a type is a pattern of wood from which the mold can be cast in iron. It is necessary to plane off the joint to get a perfect fit and due allowances must be made on the pattern for such work, to get the mold to produce a casting of the correct size. It is advisable to use other means than pins and holes for registering the two halves of the mold.

Before being used the mold should be polished well with plumbago and heated beyond 212 degrees Fahr. The molten copper should rise into the matrix from the bottom, from a U-shaped runner or sprue entirely encircling the matrix. The copper will then rise in both vertical ends of the runner establishing a balance before it enters the matrix, and in so doing any dirt from the start of pouring is held in the sprue, instead of entering the casting.

The carbon mold is also useful for casting copper especially when solid cylinders are the castings to be made. It sometimes happens that periodical orders will be obtained for such cylinders. In one foundry such an order would materialize every few months to the consternation of the foreman who knew it meant lots of trouble. They usually molded these cylinders, which were about 6 inches diameter and 18 inches long, *upright*. Feeding required a sullage head about twice the length of the casting, because it would pipe down and leave a hole in the heart of the casting. Also the castings would swell and be rough.

Two blocks of graphitic carbon solved that problem. These were fitted together like a corebox, with a sprue running to the bottom of the casting. The mold was just the proper length to make the casting and allow for shrinkage, no provision being made for a riser. This latter as well as

(*Concluded on Page* 1033)



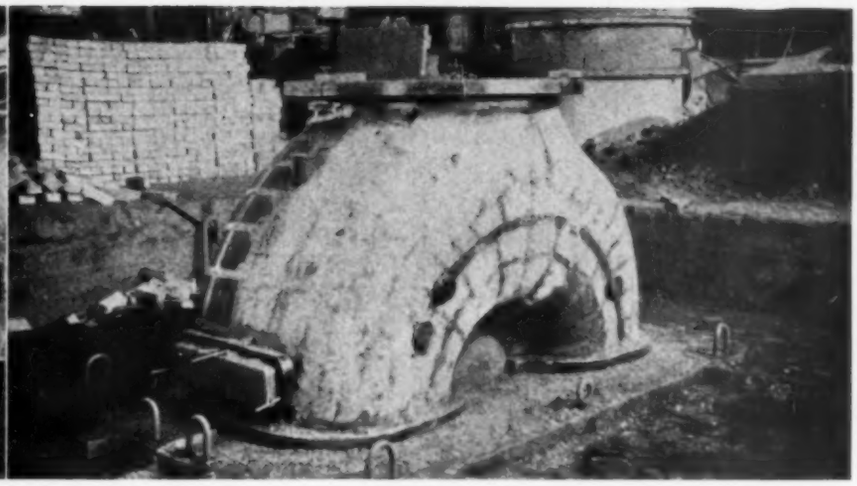


FIG. 1—TWO HALVES OF CASTING BOLTED TOGETHER. FIG. 2—PATTERN ENCLOSING CORE FOR UPPER HALF

Prefers Loam To Sand for Mold

By W. B. Kresge

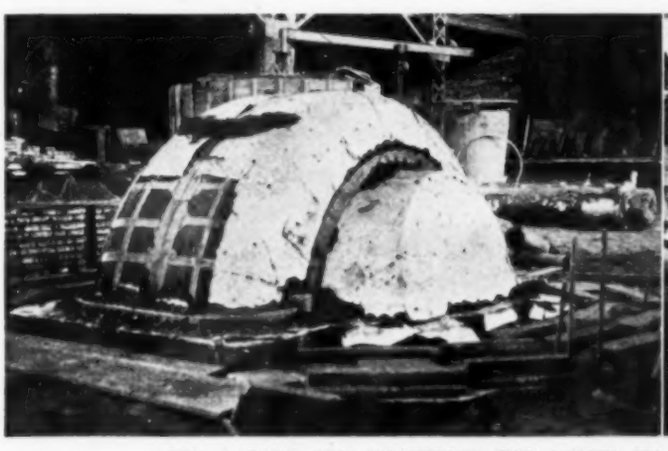
INTERESTING example of the manner in which foundrymen adapt themselves to conditions is shown in two methods adopted for making a turbine casing from the same pattern. In the first instance described and illustrated in THE FOUNDRY June 1, 1925, the skeleton pattern first was employed to make dry sand cores in halves. Then it was bedded in a pit in the floor horizontally instead of vertically as it is shown in the accompanying illustrations. This was at the plant of the Kerr Turbine Co., Wellsville, N. Y., and the castings turned out quite satisfactorily.

Recently this company was taken over by the Elliott Co., Pittsburgh with a manufacturing plant at Jeanette, Pa. Equipment including this pattern was moved from Wellsville to Jeanette. To fill a recent order the pattern again was utilized, but on account of the different local conditions it was molded vertically instead of horizontally. It was molded in loam instead of in sand and finally instead of making a seperate core, the pattern formed its own core which was left standing in position while the mold separated in two parts vertically, was lifted away to be finished and dried and later returned to place around the core.

Anticipating several orders, the skeleton pattern was constructed more carefully and substantially than usually is the case with patterns of this character. As a result of this, coupled with careful handling in the foundry and pattern storage it already has been used in the production of five castings. The ribs were cut from three-ply laminated stock 1 1-2-inches thick. The flanges were made from three rows of segments well glued and nailed and 45-degree blocks were glued and nailed in all square corners. The pattern was inspected, touched up and repainted each time it came out of the sand.

The only difference between the latest casting and the first one is that the feet have been reversed, thus placing the exhaust outlet on the top instead of the bottom. The present casting is for a 3000-horsepower turbine gear unit condensing machine to operate under a 28-inch vacuum on a dredge. Molds for the two halves of the casting were made side by side in a shallow pit and since they were practically alike a description of one mold will serve for both.

A level bed was swept on the floor and a seat and parting was built under the flanges of the pattern to compensate for the thickness of the lifting plates. The inside of the pattern then was rammed full of sand suitably rodded and braced to make the mass self supporting after the removal of the pattern. The interior was filled with coke and suitable vents were led through the openings in the pattern. Spaces between the ribs of the pattern at this time were filled with sand that was slicked off to form a smooth continuous surface. This surface was covered with newspapers and the two lifting plates were adjust-



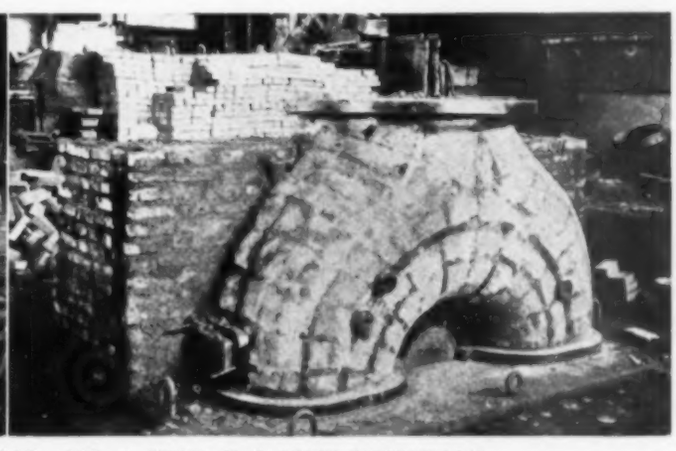


FIG. 3—CORE AND DRAWBACK FOR LOWER HALF. FIG. 4—MOLD WAS SPLIT VERTICALLY

FIG. 5—OUTSIDE OF LOAM MOLD ALMOST COMPLETED. FIG. 6—MOLD SEPARATED WITH CORE IN CENTER

ed in place on either side of the pattern.

Reference to Figs. 1, 2, 3 and 4 will show that the casting has a narrow opening on one side and a wide opening on the other. The wide opening is straight up and down and therefore presents no impediment to the removal of the cheek. The narrow opening is located far in under the bulging side of the pattern and necessitated the use of a secondary drawback as shown in Fig. 3.

Outside of the pattern was covered with a coating of loam and bricked up in the usual manner to a point flush with the top of the flange. Here a bed was swept for the reception of a cover core. Runner cores leading to the lower flange were built into the brick work. The two halves of the mold then were separated and set back from the core about 6 feet on each side to afford the molder room to walk around and attend to the necessary finishing.

Sand between the ribs of the pattern was removed to the required depth of 1 1-4-inches and then the pattern was removed in halves. Mold and core were blackwashed, covered over with thin steel sheets and dried with gas flames. Afterward the mold was reassembled and surrounded by a sectional curbing with sand rammed in the space between the brickwork and the curbing, The flange on one section of the casting was covered with a core. The finished mold with weights and runner box in position ready for the iron is shown in Fig. 8.

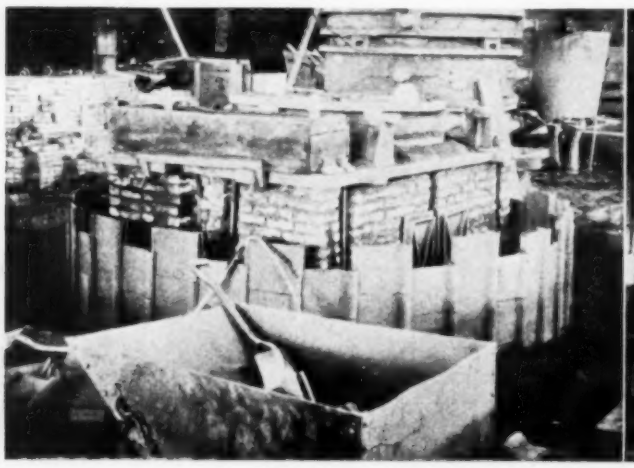
Appoints Committee

American Standards association has appointed a sectional committee on standardization of plumbing equipment. It is composed of four subcommittees organized under the division of simplified practice, department of commerce. William C. Groeniger is chairman of the sectional committee whose object is the improvement of plumbing materials and the elimination of the difficulty now experienced in matching worn faucets, bath fixtures and other plumbing equipment. George C. Whipple, professor of sanitary engineering, Harvard university, is chairman of the subcommittee on minimum requirements for plumbing in dwellings and similar buildings; A. M. Maddock, Thomas Maddock Sons Co., Trenton, N. J., heads the subcommittee on staple vitreous china plumbing fixtures; George E. Hoffman has the chairmanship of the committee on staple porcelain plumbing fixtures. The chairman of the subcommittee on enameled sanitary ware has not been appointed. Chairmen of two other subcommittees on waste traps and on brass plumbing products are to be appointed in the near future.

Among the organizations that have designated or will designate representatives to the sectional committee are: American Ceramic society, American Gas association, American Institute of Architects, American Marine Standards committee, American Society of Mechanical Engineers, American Society of Sanitary Engineering, Copper and Brass Research association, National Association of Master Plumbers, National Pipe and Supplies association, Plumbing and Heating Industries bureau, Soil Pipe Mfgs. association.

Wisconsin Group Meets

The regular monthly meeting of the Wisconsin Gray Iron group was held Dec. 6 at the Republican house, Milwaukee. Eugene W. Smith, general foundry foreman, Crane Co., Chicago, gave a talk on "Molding Sand Control in the Foundry and the Use of Artificial Binders as Substitutes for Natural Bond in Molding Sand."



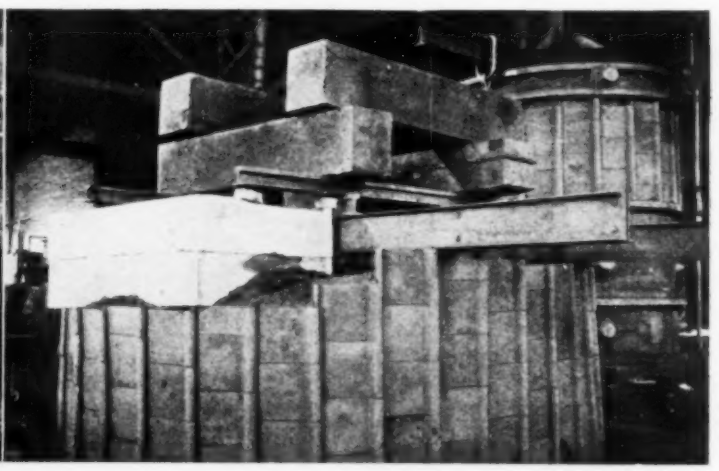


FIG. 7—ASSEMBLING AND CURBING THE MOLD. FIG. 8—READY FOR POURING

Save With Cast Banks

(*Concluded from Page* 1018)

a monkey deposited the coin either in a cocoanut, lions mouth or some such place.

Another class of savings banks was that which required skill to operate. An example is that in which a soldier shoots a coin into a target on a tree. There were many others of this type such as the one in which a cannon shoots a coin into a blockhouse when a trigger is pulled, another where a gaily painted Indian brave shoots the coin at a bear. A savings bank popular during this early period was the Columbus bank. An Indian jumps from behind a log when the coin releases a trigger and Columbus throws up one arm.

After enumerating and describing many of the banks enjoyed by former generations, there still are many that have not been mentioned. There were banks that played music when a crank was turned after the coin had been deposited. Others represented trick dogs, ponies, beehives, boys playing leap frog and many other subjects in which children took a lively interest.

These banks were extremely popular with parents as Christmas and birthday gifts. They were gaily colored, were amusing as mechanical toys, and above all, they taught children to save.

The banking institutions of today consider this method of appeal to the younger generation as antiquated. This fact was brought to the writer when he interviewed the officers of several large banks. They issue savings banks to their customers just as a matter of convenience. This type of account is not a source of revenue, so they say. They would dispense with the savings bank if they could, but since each bank's competitors have accounts of this kind they dare not discontinue them. One official was asked why he used a certain type of savings bank and the answer was, "Other institutions of this kind use that type of bank so we are forced to do so."

The management is not concerned with the kind of savings bank used. It is a matter of cost. If cast-iron banks could be supplied at a reasonable price this might open a market for castings.

The production of cast-iron savings banks has fallen off in the past few years, this probably is due to lack of originality in mechanical ideas that characterized this class of work in former days. In this business it is a matter of appeal to the public. As an illustration, one of the large five and ten cent store companies, that formerly was a large buyer of cast iron banks states that there no longer is a sale for this type of toy. Upon looking over the stocks of toy banks in several stores of this kind, it was found that modern cast-iron banks seldom are of the type to appeal to children. There was not a mechanical toy bank in any of the stores. Give a child something that moves and it is far more satisfied than with a stiff toy that gives no fun in return for saving.

Charles Vickers Says

(*Concluded from Page* 1030)

the sprue was carried by a dry sand head, which was set on top of the carbon mold. Chilling effect of the carbon permitted using only a short length in the core as a sullage head, and the castings could be made as quickly as the mold could be assembled, heated and poured. The mold lasted indefinitely, as it was stored away when not in use, and resurrected when needed.

Molding sand used for copper-castings should be at least one grade coarser than that used for brass of the same weight. In all cases it must be free and open, also refractory, for the temperature of the poured copper will be higher. Even when deoxidized with phosphorus its temperature will be close to 2300 degrees Fahr. a maximum for most red brass castings, but a minimum for copper. Red metal does not need to be heated to a high temperature to absorb hydrogen. A red heat is sufficient to allow absorption so free venting is important. As stated previously some of the steam evolved from the damp sand of the mold is dissociated into its components hydrogen and oxygen, and of these two gases, the hydrogen is the one the founder of copper is most concerned with. It has the power to diffuse into the red hot castings where it is certain to encounter some oxygen and form steam. Steam expands under superheat and cracks the castings; more frequently in such places as the internal partitions made by coring, as in a tuyere. Under water pressure such castings leak. Therefore, the cores must be vented to get off the gases quickly, for on the one hand the core may *blow*, on the other the gases may remain in contact with the hot copper long enough for the absorption of hydrogen, and the latter explores the structure of the hot copper for traces of oxygen with which to unite, in a manner similar to which occurs when rolled shapes are annealed in an atmosphere containing hydrogen. Consequently, it is advisable to use a free venting and refractory molding sand and a core containing a minimum of combustible matter to create gas to handle copper successfully in the foundry.

Wants Iron Animals

A CORRESPONDENT of THE FOUNDRY *is inquiring concerning cast iron dogs, lions, etc. suitable for lawn and garden ornamentation. Who has such patterns?*

Establish Sales Firm

The Brewster-Nicholas Co., 4169 West 25th street, Cleveland, has been established to handle sales of foundry equipment and supplies, by L. B. Brewster and H. C. Nicholas.

Mr. Brewster, who has become interested in the Titgen-Eastwood Co., Philadelphia, heads the new organization. He was employed for the past six years as district sales manager for the W. W. Sly Mfg. Co., Cleveland. Previous to that time he was employed by the Fox Furnace Co., Elyria, O., the Ober Mfg. Co., Chagrin Falls, O. He was graduated from Case School of Applied Science in 1908, following which time he became metallurgist and handled personnel work for the Ferro Machine & Foundry Co., Cleveland. Later he was engaged in foundry engineering work for the Hamilton Foundry & Machine Co., Hamilton, O.

Mr. Nicholas also formerly was connected with the W. W. Sly Mfg. Co. Previous to that time he served the Hamilton Foundry & Machine Co. and the Edna Brass Mfg. Co., Cincinnati, in various capacities.

The new firm will handle sales in western New York and Pennsylvania, Ohio, Indiana and Michigan for the Titgen-Eastwood Co., Philadelphia, foundry equipment builders; Paxson-Taggart Inc., Philadelphia, sand and foundry supplies; and Kirk & Blum Mfg. Co., builders of blowers and dust arrester equipment.

Institute Expands

Arthur J. Tuscany, manager, Gray Iron institute, Cleveland, has announced that the following companies have recently become connected with that organization: Atlas Foundry Co., Irvington, N. J.; Francis & Nygren Foundry Co., Chicago; Pioneer Foundry Co., Waukesha, Wis.; Milwaukee Gray Iron Foundry Co., Milwaukee; Snead & Co., Jersey City, N. J.; Gartland Foundry Co., Terre Haute, Ind.; Consolidated Castings Co., Cleveland; Fremont Foundry Co., Fremont, O.

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶ Grouping Cost Work

MUCH has been said in recent years on the subject of foundry costs. Competition from within and without the industry has aroused many individual companies to the need for exacting methods to determine the cost of producing castings. Cost sessions have featured the meetings of technical societies devoted to the industry, and through the efforts of several trade groups, uniform systems now are in use in the malleable and steel industries.

DUE to the wide variety of foundries making a multiplicity of products in the gray iron industry, the operation of a uniform cost system in the entire industry at present seems almost impossible. Nevertheless, some uniformity is desirable. If a foundry operates an accurate cost system upon which to base the selling price of castings, but loses the business to a competitor who arrives at his cost figures by erroneous methods, the accurate cost system is of little value. To meet competition, the enterprising foundryman not only must determine his costs correctly, but he also must teach his competitors to do likewise.

FOR that reason, the local group probably is the logical unit for applying uniform cost systems in the gray iron industry, at least for the present. This work already has been undertaken by several groups with highly satisfactory results. For example, a cost group has been in operation in the Newark, N. J., district for five years. The original organization consisted of 6 foundries, but today 12 plants are members. This has resulted in a better cost system for each of the foundries represented, less difficulty in securing business at a profit, and generally improved conditions in the district. Cost reports have enabled the individual foundries to save thousands of dollars yearly in various departments.

Solution of cost problems in the malleable and steel fields has been aided greatly by the work of the specific associations heading each of those industries. In a like manner, the Gray Iron institute has the opportunity to further cost work in the gray iron industry. By working through groups, several of which already have proved highly successful in certain districts, the national body may render a valuable service in correcting some of the illadvised practices of the industry.

¶ Mark Your Roof

AVIATION is progressing at a remarkable rate. A number of new factories have been built during the year and additional plants are contemplated. Production schedules have been increased to meet the demands from individuals and commercial companies. New airplane routes have been opened to transport passengers, express and mail. Ground facilities have been increased by additional airports and hangars. One airplane builder, who has constructed 11,000 planes since 1911, announced recently that he will build a 32-passenger plane which will be placed in operation on a 36-hour transcontinental flying schedule in 1929. Ground has been broken for the hangars to house the two airships which the navy is having constructed. As aviation progresses, the foundry industry will benefit, since castings are indispensable in manufacture of any type of aircraft.

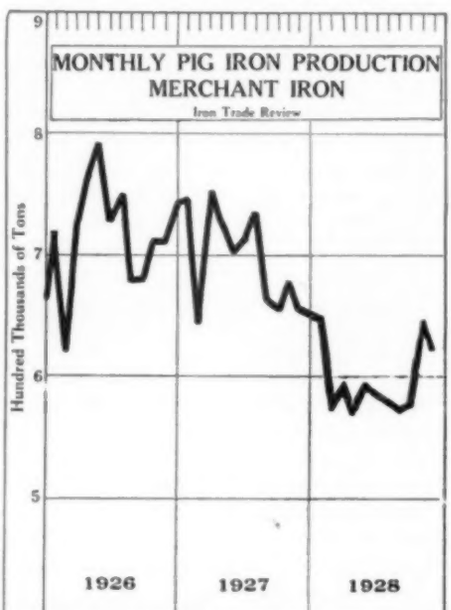
THE foundry industry has the opportunity of assisting aviation by taking a part in the campaign for the identification of towns and cities by roof-marking, which is being conducted by the Daniel Guggenheim Fund for the Promotion of Aeronautics Inc., New York. The identification of towns by the aviator is the first requisite for an air transportation system which will heighten the efficiency of American business through a swifter means of communication. The fund has enlisted the assistance of postmasters in towns with a population between 1000 and 50,000, and is asking the co-operation of industries in such towns. Complete information regarding the standardized method of marking may be obtained from the fund headquarters, 598 Madison avenue, New York.

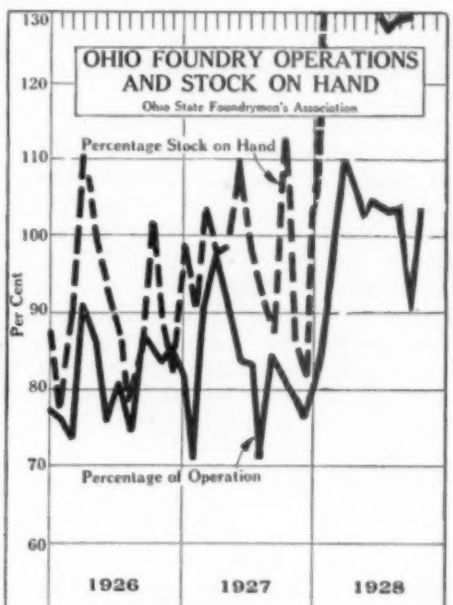
Trade Trends in Tabloid

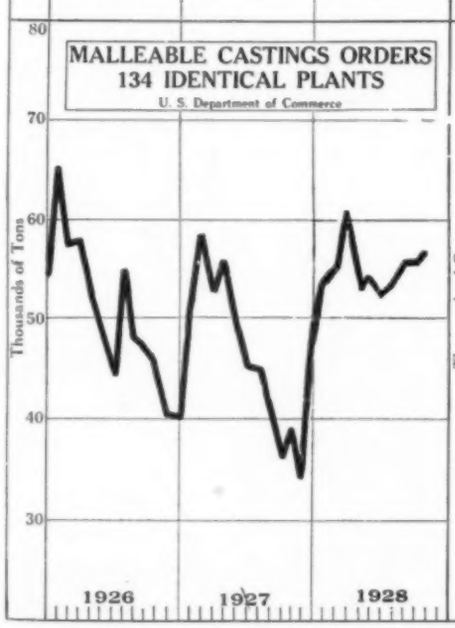
THE year draws to a close with foundry operations at an unusually high level. Nor is one particular class or division of the industry singled out for unusual favor in the volume of castings orders. Stove and radiator foundries are busy, and purchases of iron by such companies indicate a faith in continued activity during the early part of 1929. Freight car buying has picked up, promising better business for the steel foundry industry. The Philadelphia Federal Reserve district, according to compilations of the University of Pennsylvania, reports increased production in steel, gray iron and malleable operation. Farm equipment sales during 1928 were 25 per cent ahead of the previous year. Pig iron production for November, according to statistics in *Iron Trade Review*, decreased from 3,373,539 tons in October to 3,303,680 tons in November. However, the daily average production for November was 1299 tons per day ahead of the preceding month. Merchant iron production totaled 643,043 tons in October, and 625,101 tons in November. During November one merchant furnace was blown in and two were blown out. Average monthly New York prices for nonferrous metals, according to *Daily Metal Trade*, follow: Casting copper, 15,671c; electrolytic copper, 16.00c; Straits tin, 50.776c; lead, 6.387c; antimony, 10.168c; aluminum, 23.90c. Zinc averaged 6.266c, E. St. Louis, Ill.

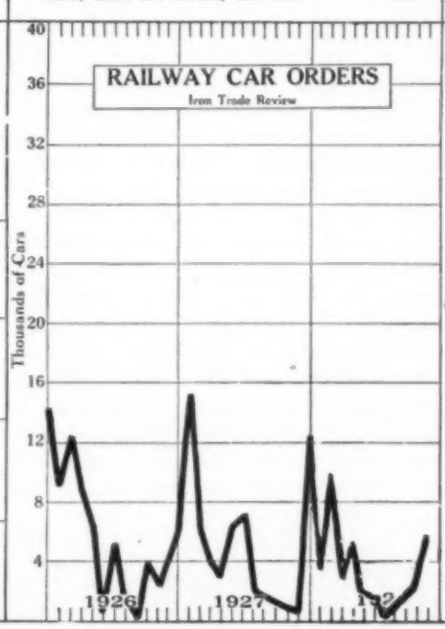
RAW MATERIAL PRICES
Dec. 6, 1928

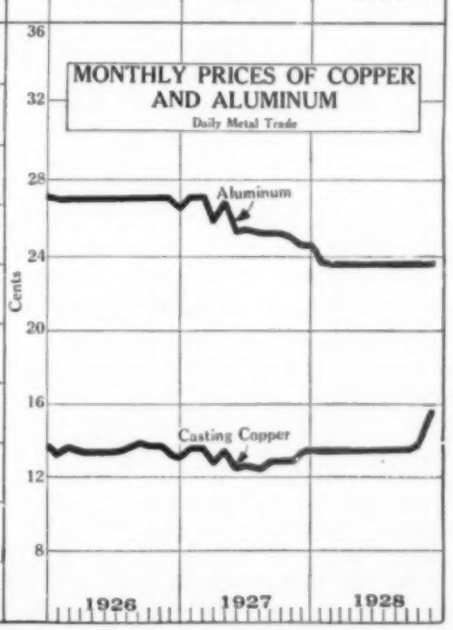
Iron	
No. 2 foundry, Valley	$18.00
No. 2 southern, Birmingham	16.50 to 17.00
No. 2 foundry, Chicago	20.00
No. 2 foundry, Philadelphia	21.26 to 21.76
No. 2 foundry, Buffalo	18.50
Basic, Valley	17.50 to 18.00
Basic, Buffalo	17.50
Malleable, Chicago	20.00
Malleable, Buffalo	19.00
Coke	
Connellsville foundry coke	$3.75 to 4.85
Wise county foundry coke	4.50 to 5.25
Scrap	
Heavy melting steel, Valley	$16.75 to 17.00
Heavy melting steel, Pitts.	17.00
Heavy melting steel, Chicago	14.50 to 15.00
Stove plate, Buffalo	14.00 to 14.50
Stove plate, Chicago	12.25 to 12.75
No. 1 cast, New York	13.00 to 13.50
No. 1 cast, Chicago	15.25 to 15.75
No. 1 cast, Philadelphia	16.50 to 17.00
No. 1 cast, Pittsburgh	15.00 to 15.25
No. 1 cast, Birmingham	14.50 to 15.00
Car wheels, iron, Pittsburgh	15.25 to 15.75
Car wheels, iron, Chicago	14.25 to 14.75
Railroad malleable, Chicago	15.50 to 16.00
Agricultural mal., Chicago	13.00 to 13.50
Malleable, Buffalo	15.50 to 16.00
Railroad malleable, Pitts.	14.00 to 14.25
Nonferrous Metals	Cents per pound
Casting, copper, refinery	15.50 to 15.75
Electro, copper, producers	16.00
Straits tin	51
Lead, New York	6.50
Antimony, New York	9.75 to 9.87½
Nickel, electro	37.00
Aluminum, No. 12, producers	23.00
Aluminum, No. 12, remelt	16.50 to 17.00
Zinc, East St. Louis, Ill.	6.50











Personal

B. J. Steelman, for a number of years associated with the Wanner Malleable Castings Co., Hammond, Ind., has been made manager of the Kalamazoo, Mich., branch of the Wagner Malleable Iron Co., Decatur, Ill.

Wadsworth Doster, recently Eastern representative for the Mackintosh-Hemphill Co., Pittsburgh, has been appointed to serve in a similar capacity with the United Engineering & Foundry Co., Pittsburgh. Previously he was manager of the Blake & Johnson Co., Waterbury, Conn., for many years.

E. V. Nixon, Thompsons Engineering & Pipe Co., Ltd., Castlemaine, Victoria, Australia, spent a short time in the United States on his return home from a visit to England. While here, he studied steel foundry association activities.

George Adams has been appointed sales manager of the Bunting Brass & Bronze Co., Toledo, O.

Pat Dwyer, engineering editor, THE FOUNDRY discussed various present day trends of the foundry industry under the heading "The Foundry Is on the Way, Where?" At a largely attended meeting of the Buffalo Foundrymen, Buffalo, on the evening of Dec. 12. He stated that instead of bewailing the loss of old markets, foundrymen should develop the present market to a greater extent and exercise ingenuity in discovering and exploiting new markets.

P. N. Guthrie Jr., has been appointed vice president of the Reading Iron Co., Reading, Pa. The general sales offices of the company will be transferred to 30 Church street, New York. Mr. Guthrie will have charge of sales and H. F. Mattern will continue as general sales manager.

Herbert W. Stone, vice president and general manager of the United States Hoffman Machinery Corp., Syracuse, N. Y., has been promoted to the presidency to succeed the late Eugene D. Stocker.

Dedicate Building

The Yale & Towne Mfg. Co., Stamford, Conn., dedicated its new service building on Nov. 26. It is of colonial brick, trimmed with Indiana limestone and the lobby is of marble. Funds for the erection of the building, which will be known as the Towne Service building, were provided through a special request in the will of the late chairman of the board, Henry R. Towne. The main floor of the building houses the works hospital, dental clinic and industrial relations bureau; the second floor has an auditorium and library; and in the basement are the bowling alleys and pool tables. The cost of construction and maintenance approximates $500,000.

Booklet Describes Tour for Foundrymen

A 44-page illustrated booklet has been issued giving details of the arrangements for the Third International Foundrymen's congress which will be held in London, June 11 to 15, 1929. It contains full information regarding the various tours which have been made for the convenience of American foundrymen who expect to attend the congress. The booklet, which was prepared under the supervision of the committee on international relations of the American Foundrymen's association, is being distributed by the association and by the official travel agents, Thos. Cook & Son.

A general description of the Third International Foundrymen's congress follows a foreward by S. T. Johnston, president, American Foundrymen's association. Subsequent sections of the booklet describe the arrangements which have been made for plant visitation, sightseeing, and the official tours. The latter section, includes detailed itineraries and quotes rates of fare covering the trip to the London congress itself, the official preconvention tour of Great Britain, and a choice of three postconvention tours covering attractive sections of the continent of Europe.

An American foundryman may attend the Third International Foundrymen's congress for as little as $391 from New York, including round-trip, cabin steamship accommodations, hotel rooms in London, breakfasts while ashore, local sightseeing, entertainment, etc. The most elaborate tour listed covers most of England and Scotland, Belgium, Germany, Switzerland, Italy, and France.

The booklet is illustrated with reproductions of events at the First International Foundrymen's congress in Paris in 1923 and typical European scenes.

Copies may be obtained from the official travel agents, Thos. Cook & Son, 585 Fifth avenue, New York, or C. B. Hoyt, executive secretary, American Foundrymen's association, 222 West Adams street, Chicago.

The Canton Steel Foundry Co., Canton, O., has been reorganized and will start operations Jan. 1. A. F. S. Blackwood is in charge.

Readers Comment

Note—Material appearing under this head does not necessarily reflect the opinion of THE FOUNDRY or of its editors.

TO THE EDITORS:

In a recent issue of THE FOUNDRY the condition of sand burned to the face of steel castings was discussed. A statement was made that clay reduced the fusion point of the mix when added to the sand to supply the necessary bond. This statement may or may not be true depending on whether the company buying the clay is interested enough to find out just what it is buying. Clays are on the market which have a high enough fusion point not to lower the fusion point of the mix. It has been my experience that clays containing 55-60 per cent silica and about 30 per cent alumina give good results. If the silica exceeds much more than 60 per cent, we generally ran into trouble. However, I am convinced that too much faith must not be placed in the fusion point determination. A certain company is doing some work on the sintering points of various sands and clays and I am sure some astonishing facts will be brought out.

H. L. NORMAN

Using Cast Iron Bearings

TO THE EDITORS:

In considering the subject of new uses for castings, why is it that nothing has been published regarding the use of cast iron for bearings. It is my opinion that a good gray iron bearing running on a soft steel shaft will outwear other types of bearings, providing of course that it is lubricated properly.

I have in my plant many bearings of cast iron which have been so constructed that they have run on grinding machines from 5 to 13 years without adjustment of any kind. I have an electric motor direct connected to a 9-inch grinding wheel. This motor has run for 4400 nine hour days and during the war the machine was operated 24 hours a day. The cast iron bearing on this motor never has needed taking up and does not appear to be looser than when installed.

Why do manufacturers of motors and other equipment use various other types of bearings when, with little trouble, they may satisfy themselves that properly fitted gray iron bearings will outwear the other forms, will use less power, give less trouble and cost less to install.

W. HANGLITER,
Hangliter Mfg. Co., Pasadena, Calif.

Urge Specifications as Ingot Price Basis

Initial steps were taken toward standardization and simplification of specifications for the purchase of copper alloy ingot at a meeting held in Cleveland, Nov. 26. A committee, sponsored by the American Society for Testing Materials, adopted resolutions which put into motion the work of amassing the information and data needed to undertake this important work.

Co-operation of organized bodies within the industry as well as individual ingot metal producers, consumers and business papers is to be sought by the committee in the formulation of a program designed to remove unsatisfactory practices now followed in buying and selling. G. H. Clamer, Ajax Metal Co., Philadelphia, was elected chairman of this special committee. C. L. Warwick, secretary of the American Society for Testing Materials, will serve as secretary. Others attending the meeting were: William Romanoff, H. Kramer & Co., Chicago; F. L. Wolf, Ohio Brass Co., Mansfield, O.; W. B. Price, Scovill Mfg. Co., Waterbury, Conn.; L. B. Case, Society of Automotive Engineers; Adolph Bregman, *Metal Industry;* E. P. Trench, *American Metal Market;* Dan M. Avey, THE FOUNDRY; Walter S. Doxsey and William M. Rooney, *Daily Metal Trade.* Three members of the committee were unable to attend the meeting. They were: C. B. White, Nonferrous Ingot Metals institute; J. W. Bolton, Lukenheimer Co., Cincinnati, and J. Zimmerman, *Daily Metal Reporter.*

N. K. B. Patch, Lumen Bearing Co., Buffalo, was recommended for appointment to membership on this special committee.

The necessity for standard specifications to eliminate the uncertainty and conflict which now exists was emphasized. It was brought out that hundreds of copper alloys now are produced and that no one set of standards is followed. Some consumers order metal to their own specifications, others accept individual producers' analyses, others the adopted codes of the various technical and metallurgical associations. Because of this, practice in the production of ingot metals varies greatly with a corresponding lack of uniformity in buying and selling practices.

It was stated that from 75 to 90 per cent of all the ingot metals produced today is specification metal. However, due to the diversity of specifications there is an utter lack of uniformity and standardization, which, it was recognized, is uneconomic both from a producer's and consumer's standpoint. Obviously the consumer ultimately pays for this diversity.

Compilation of the necessary data, which will include the gathering together of all specifications now in use, was decided upon as the first step in the formulation of a definite program. This work will be undertaken at the earliest possible time by the committee, which will be known as "A Special Committee to Promote General Use of Specifications for Copper Alloys."

The committee will endeavor to make available to industry through the machinery of the American Society for Testing Materials a program of simplification and standardization that will result in more uniform practices, bringing material economies and advantages to consumers and producers alike.

Faked Foundry Facts

A Deep Pocket

Shrinkage Cracks Show on Wheel Treads

Question: Shrinkage cracks show on some of our heavy 18-inch diameter mine car wheels. We find one and sometimes two of these cracks on the tread of each wheel. They are shallow, never exceeding ⅛-inch and while probably they would not detract from the utility of the wheels, still the wheels are condemned by the inspector.

Answer: This annoying trouble which occasionally turns up in a wheel shop may be due to cold iron, unsuitable coating material, condition of the chills, or, to all three. In remote cases it has been traced to pouring wheels off the level. For extended reference to the subject see West's *American Foundry Practice,* pages 248-275. Practically every phase of wheel making was covered by the late H. E. Diller in a series of six articles in THE FOUNDRY, April 1 to June 15, 1920. The molds must be set perfectly level so that gravity will not interfere with an even and uniform pull from the rim to the center during the contraction period. The chills must be thoroughly dry and cold sand should be used to prevent condensation of moisture. The chills are coated with a mixture of shellac and rosin, or, with blacking mixed with machine oil and coal oil. These mixtures ignite to dry the face of the chill, help to prevent wrinkles and deposit a slight coating or carbon that imparts a good skin to the casting. Hot iron poured quickly also will insure a uniform setting speed for the skin of iron next the chill and a consequent uniform contraction of the entire circumference. The method of gating and style of pouring may be contributory factors. Intermittent pouring or small gates may cause the iron to rise unevenly around the rim and then allow it to stand for a few seconds with peaks and valleys while the remainder of the mold is catching up. The light skin formed at the high points, later is broken by the pressure of the molten metal when the mold is filled.

Test Bearing Bronzes

The department of commerce, bureau of standards, has conducted a series of tests on both chill and sand-blast railroad bearing bronzes to determine their tensile and impact properties, resistance to pounding and to wear. The bureau states, according to its investigation, no justification appears for the wide variety of bearing metal compositions specified for the same class of service. It also recommends the A.S.T.M. specifications for railroad bearing bronzes.

Wagner Electric Co., St. Louis, has moved its Los Angeles branch office and service station to 1220 South Hope street, Los Angeles.

Obituary

Joseph Horton, British staff correspondent for THE FOUNDRY, died Nov. 30, at Birmingham, Eng. after a year's illness. Mr. Horton was born in 1860 at Wednesbury, Eng. in the heart of the "Black Country" and was the son of John Horton foreman hammerman for the Monway Steel works. He was educated at the Wesleyan school in Wednesbury and for some years was employed in one of the local iron, steel and tube

JOSEPH HORTON

trades. Later Mr. Horton joined the staff of the *West Bromwich Free Press* and in 1888 became editor of the *Labour Tribune*, the organ of the miners and iron workers. When the paper ceased publication in 1896, he worked for the *Birmingham Daily Argus*, an evening newspaper, as a staff member and in three years became chief reporter. In 1902 he left the paper on a change of proprietorship and became a free lance journalist specializing on trade news especially on iron and steel. Several years later he became Birmingham correspondent for the Penton Publishing Co., and THE FOUNDRY. In later years he took on a partner the firm being known as Horton & Garbutt. Since becoming correspondent for THE FOUNDRY, Mr. Horton has given its readers much information on English methods. Articles on unique castings and experiences in foundry work have given the readers an insight into English foundry practice.

John G. Way, for the past 20 years general manager of the New Process Stove Co., Cleveland, and a director of the American Stove Co., Cleveland, died suddenly Nov. 18 following a heart attack. He was 55 years old and had been connected with the company for 33 years.

Francis Marion King Sr., 82, president of the North Wales Machine Co. Inc., North Wales, Pa., and treasurer and manager of the Challenge Machine Co., Philadelphia, died at his residence in Philadelphia Nov. 20. Mr. King was born in Wilmington, N. C., but about 40 years ago located in Philadelphia.

Ralph H. Bourne, aged 45 years, former vice president of the Whiting Corp., Harvey, Ill., died of pneumonia while on a hunting trip on Cade Cod. Mr. Bourne was a native of Cleveland and was graduated as a mechanical engineer from Cornell university in 1905. He married the daughter of J. H. Whiting, founder, former president and now chairman of the board of directors, of the Whiting Corp. Mr. Bourne remained as vice president until about a year ago. His home was in Chicago.

J. E. Annis, one of the best known manufacturers and citizens of Chattanooga, Tenn., died Dec. 1, at the age of 73. Mr. Annis has been identified with the industrial life of the city about 38 years. He was chairmain of the board of the Cahill Co., formerly the Chattanooga Roofing & Foundry Co.

Book Review

Elementary Foundry Technology, with special reference to gray iron and steel, edited by L. A. Hartley; 423 pages, 5½ x 8 inches, cloth; published by McGraw-Hill Book Co., Inc., New York and supplied by THE FOUNDRY, Cleveland, for $3.00. In London, England, by the Penton Publishing Co., Ltd., 416-17 Caxton House, Westminster for 15s.

This text on elementary foundry technology with special reference to gray iron and steel is one of a series of text books designed to serve the foundry in schools and in industry. They conform to the requirements for instruction as set up in the minimum standards of four-year foundry apprenticeship in the United States. Co-ordination of material from different fields has been well balanced to fill the need of vocational schools and practical foundrymen in the shop. Subject matter selected from elementary physics and chemistry is broad enough in scope to furnish a foundation for the contributions of the technical experts. The text is plain and simple. A young student with only a little knowledge of chemistry readily will understand the applications presented. Foremen and other foundrymen whose opportunities for instruction have been limited will appreciate this work. An interesting feature of the book is the list of questions which follow each chapter and which have been designed to test the foundry knowledge and reasoning power of the student, rather than his ability to memorize the text. General impression of the field covered may be gathered from the following list of main divisions: Substances and their structure; physical properties; oxidation, reduction and combustion; force and motion; application of force; mechanics of fluids;

RALPH H. BOURNE

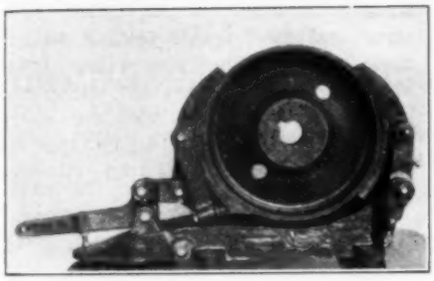
effects of elements on iron; iron; the cupola; foundry sands; electric steel foundry; molding machines. A glossary, index and bibliography add considerably to its value as a text book.

Appointed Agent

George R. Johnson has been appointed resident agent of M. A. Hanna & Co., Pittsburgh. Mr. Johnson succeeds George Buchwell, resigned. He has been connected with the pig iron business for a number of years, both in the sales and operating departments.

Extends Invitation

The Wisconsin Gray Iron group, through an invitation extended to them by the Chicago Foundrymen's club, met in conjunction with the latter body at the City club, Plymouth court, Chicago, Dec. 6. Dr. Edward Marbaker, Mellon Institute of Industrial Research, Pittsburgh, addressed the meeting on "Cast Iron."



MOLDED ASBESTOS SHOES ARE USED

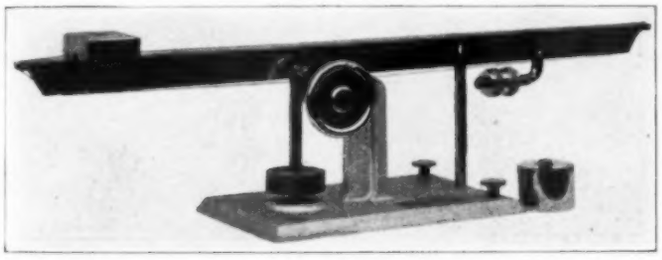
Builds Foot Brake

Electric Controller & Mfg. Co., 2700 East Seventy-ninth street, Cleveland, has introduced a new type of brake arranged for lever operation for use on the bridge drives of electric traveling cranes, electric hoists and other applications requiring foot-operated or hand-lever operated brakes. The brake is the shoe type and is a modification of the electrically operated brake made by the same manufacturer. Wearing parts of the mechanically operated brake are interchangeable with those of the electrically operated brake. Molded asbestos brake shoes of extra thickness are provided, as shown in the accompanying illustration.

Tests Bonding Materials

Harry W. Dietert, Detroit, recently has introduced a clay bond testing machine for testing molding sand bond materials. The device consists of a base on which a sensitive beam balance is mounted. One disk is attached to this beam while a second disk is attached to a base. When the rider weight is moved to the left end of the beam balance, the two plates are pressed together, as shown in the illustration. When the rider weight is moved to the right by turning the hand wheel, the two disks are pulled apart, which indicates the strength of the bond.

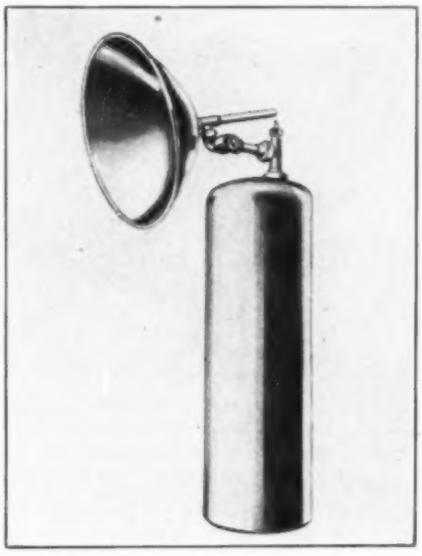
The principle of the device is as follows: The bonding material first is mixed with water to make a paste. After thorough mixing, the faces of the two steel disks are coated with this paste. The two disks are pressed together and then are pulled apart by moving the beam balance. The stronger the bonding material the greater the pull required to separate the disks.



MOVING THE BEAM TO THE RIGHT SEPARATES THE DISKS

Flood Light Is Portable

The Prest-O-Lite Co. Inc., 30 East Forty-second street, New York, recently has introduced a flood light attachment which provides a portable flood lighting unit for outside illumination. The reflector is 10 inches in diameter and may be removed from the tank by unfastening a single knurled nut. A new type of burner has been placed at the focal point and it is claimed that no adjustment is required. As shown in the accompanying illustration universal adjustment of the lamp is secured through one swing joint.



A NEW TYPE OF BURNER IS PROVIDED

Mixer Has Split Hopper

A new type of sand mixer recently has been introduced by the Flynn & Emerich Co., Holliday and Saratoga streets, Baltimore. The machine, which is shown in the accompanying illustration, may be suspended from some overhead support or mounted on legs in any location. A 3-horsepower motor is placed above to avoid dust and dirt and is direct connected to mixing disk in the hood. As may be noted in the illustration, the hood is split thus making it possible to reach the moving disk to clean or to replace the pins. The roller toe bearing, located at the bottom of the drive shaft and disk, is encased completely to prevent the entrance of dust. The unit may be fed either by shoveling the sand directly into the hood or by mechanical feeding.

THE MOTOR IS MOUNTED ABOVE THE MIXING COMPARTMENT

Issues Bulletin

The November bulletin of the American Electrochemical society of which Colin G. Fink, Columbia university, New York, is secretary, gives the details of the Toronto meeting of the society. Various other information including those elected and those who have applied for membership in the organization is given. A list of patents and recent periodical literature both in this country and abroad also is included.

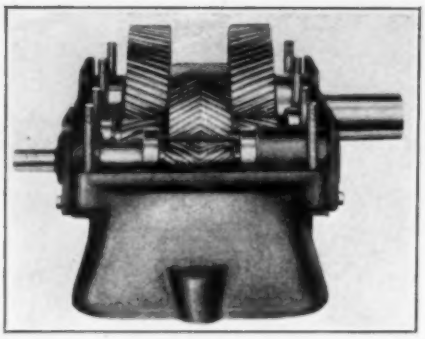
Gray Iron Group Meets

The fifteenth regular monthly meeting of the Wisconsin Gray Iron Foundry group was held at the Republican house, Milwaukee, Nov. 7. C. J. Freund, supervisor of apprentices, The Falk Corp., spoke on, "Apprentice Training in Foundries," and Harold S. Falk, vice president and works manager, The Falk Corp., gave a discussion of this subject.

Receives Appointment

Calvin R. McGahey has been appointed to the sales engineering force of the Hill Clutch Machine & Foundry Co., Cleveland. Mr. McGahey's territory will include Virginia, Tennessee, North and South Carolina, Alabama, Florida, Mississippi, and Louisiana. He has made a specialty of handling power transmission equipment for some time.

Reading Chain & Block Corp., Reading, Pa., has moved its New York office from 11 Park place to 30 Church street, New York.



ANTIFRICTION BEARINGS ARE USED THROUGHOUT THE UNIT

Reducer Housing Is Made of Cast Iron

The Palmer-Bee Co., Detroit, has placed a new line of herringbone speed reducers on the market. In this line of reducers, one of which is shown in the accompanying illustration, antifriction bearings are used throughout. Ball bearings are used on the high speed shaft and roller bearings on the intermediate and low speed shafts. Gears are the continuous herringbone type. In the double and triple series, the slow speed gears are divided in the center to permit a more symmetrical arrangement of the gearing and a uniform load on each bearing. A three point method of bolting the reducer to the sub-base has been adopted. The housing is cast iron strongly ribbed at points where the stress is greatest. The housing is made in two parts and an ample number of bolts are employed to prevent the cover from working loose. It is claimed that the efficiency of the single series reducer is approximately 99 per cent and the double series about 97 per cent.

Issues Brochure

Frank D. Chase Inc., engineers and architects, 720 North Michigan avenue, Chicago, recently has issued a brochure entitled, "Profits from Industry." This booklet tells of the service the company renders in problems of industrial plant location, layout, production, equipment, material handling, design and construction. It also gives of some of the large undertakings of the company. The brochure is divided into sections on plant location, plant layout, plant expansion, equipment layout, material handling, building design, construction, various types of factories, costs, power plants, commercial buildings and consultation. Each section is well illustrated with views of the many buildings and factories which this company has constructed. A list of clients of the company is included.

Uses Vibrating Screen To Reclaim Sand

The Link-Belt Co., 910 South Michigan avenue, Chicago, has developed a vibrating type screen designed for removing oversize refuse and burned sand from used steel foundry sand. The mechanically vibrated screen and the elevating mechanism, which recently has been installed in several steel foundries for the reclamation of sand, is shown in the accompanying illustrations. The unit, which is shown in Fig. 2, consists of an inclined belt and bucket elevator, the exact height depending upon local conditions; a steel feed-hopper for receiving the sand from the elevator and delivering it to the screen; a double deck vibrating screen with steel hopper under the lower screening surface for collecting the fines; and a two-way discharge chute from the ends of both screening decks for discharging the rejects into such receptacles as may be provided.

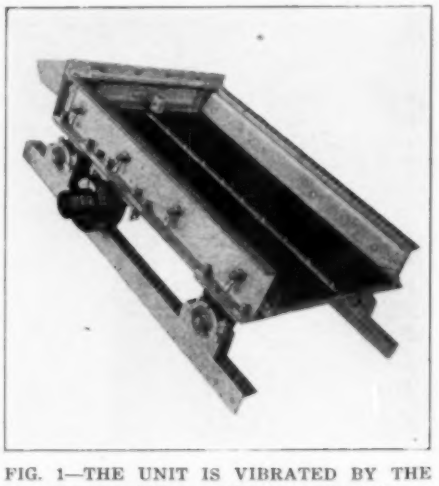


FIG. 1—THE UNIT IS VIBRATED BY THE UNBALANCED DRIVING PULLEY AND FOUR SPRINGS

The material passing over the end of the upper screening deck consists of foreign matter. The bulk of the sand delivered to the reclaiming unit is discharged over the end of the lower screening deck and consists of good reusable sand. The bottom of the fines collecting hopper is fitted with a hand - operated, undercut, discharge gage. The screen and the bucket elevator are supported by a structural steel frame resting on concrete piers. The supporting frame also carries a countershaft which may be driven from any standard source of power, and upon which the elevator head shaft and the vibrating screen are driven.

A bar grating covering the pit at the foot of the bucket elevator, excludes pieces of foreign matter that would be too large for the bucket elevator or screen to handle. A large lump of sand also may be broken up easily on this grating.

Equipment Orders Gain

The index of gross orders for foundry equipment in October was 185.0 as compared with 170.0 in September, according to a recent report of the Foundry Equipment Manufacturers association. The index of shipments in October was 254.3 as compared with 129.7 for September. Unfilled orders showed 462.6 for October against 529.5 for September. The base is the average monthly shipments for the years 1922-23-24. Comparison of monthly orders as presented by association follow:

	1924	1925	1926	1927	
Jan.	141.8	104.2	168.2	180.4	[illegible]
Feb.	121.0	108.8	154.9	198.0	123.6
March	121.9	159.3	157.3	131.1	138.6
April	146.8	124.3	113.2	130.0	97.7
May	108.0	113.3	128.5	134.8	
June	96.4	110.5	133.5	138.4	
July	62.8	117.0	127.3	89.9	..
Aug.	77.5	190.0	141.2	106.4	278.0
Sept.	66.0	94.2	114.0	80.4	170.0
Oct.	85.5	149.5	140.5	98.0	185.0
Nov.	91.4	180.3	133.4	95.8	.....
Dec.	137.8	140.1	181.0	106.8	.....

Kirk & Blum Mfg. Co., Cincinnati, has opened a branch factory with sales and engineering offices at 4718 Burlingame, near Broad street, Detroit. The company will remove its district office from 3-128 General Motors building to the new location.

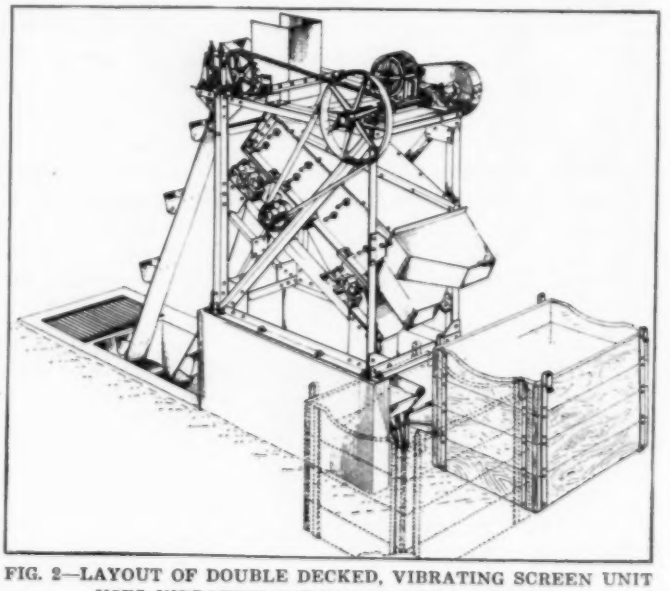


FIG. 2—LAYOUT OF DOUBLE DECKED, VIBRATING SCREEN UNIT USES VIBRATING SCREEN TO RECLAIM SAND

Discusses Problems of Gas Industry

The engineering extension department, Purdue university, Lafayette, Ind., recently has published bulletin No. 18. The paper contains the address of R. B. Harper, chief testing engineer, The Peoples Gas Light & Coke Co., Chicago, presented at the third annual gas meter school held at the university, Nov. 8-10, 1927. It tells of the many problems which are confronting the gas industry at the present time. These problems are: Rates, regulation, quality, production, treatment, by-products, mixing, storage, distribution, measurement, sales, appliances and utilization. Copies of the bulletin may be obtained by addressing the director of engineering extension department, Purdue university, Lafayette, Ind.

Fills Flasks with Sand

The Jeffery Mfg. Co., Columbus, O., now is marketing a device for filling flasks with sand. The equipment was designed primarily to avoid the necessity of keeping sand on the floor, to eliminate shoveling, to gain floor space and to increase production. This equipment may be constructed to meet the particular needs of the foundry in which it is installed.

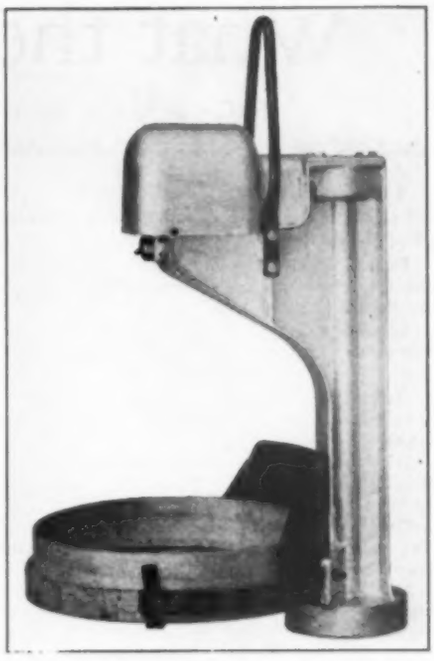
The equipment shown in the accompanying illustration consists of a hopper which has a top level with the floor and covered with a grating. The hopper has a capacity of approximately 30 tons of tempered sand. The bottom of the hopper consists of an apron conveyor of the double beaded flight type, which pulls the sand from the hopper and feeds it to an elevator of the chain and bucket type. The elevator in turn feeds the sand upon a belt conveyor which travels over an arc of about 180 degrees.

The entire unit is started and stopped by push-bottom control located at a convenient point for the molder. The sand is cut and tempered at night and the hopper is filled to the top so that the molder has a supply of 30 tons of sand in the morning.

Have Colored Lenses

The Oxweld Acetylene Co., 30 East Forty-second street, New York, recently has introduced a new cap and skeleton type helmet goggles. The cap type goggle consists of a strong fiber cap to which a pair of goggles are attached by fiber links. The goggles may be raised over the forehead readily and may be lowered over the eyes with one hand. The bridge is adjustable and is covered with rubber insulation. Replaceable lenses are used, and the colored lenses are protected by cover lenses of clear glass. Skeleton type goggles are of the same construction except that the goggles are attached to a lattice skeleton cap. Both styles have leather straps at the rear for head size adjustment. A view of the skeleton type goggle is shown in the accompanying illustration.

THE GOGGLES MAY BE RAISED OR LOWERED READILY



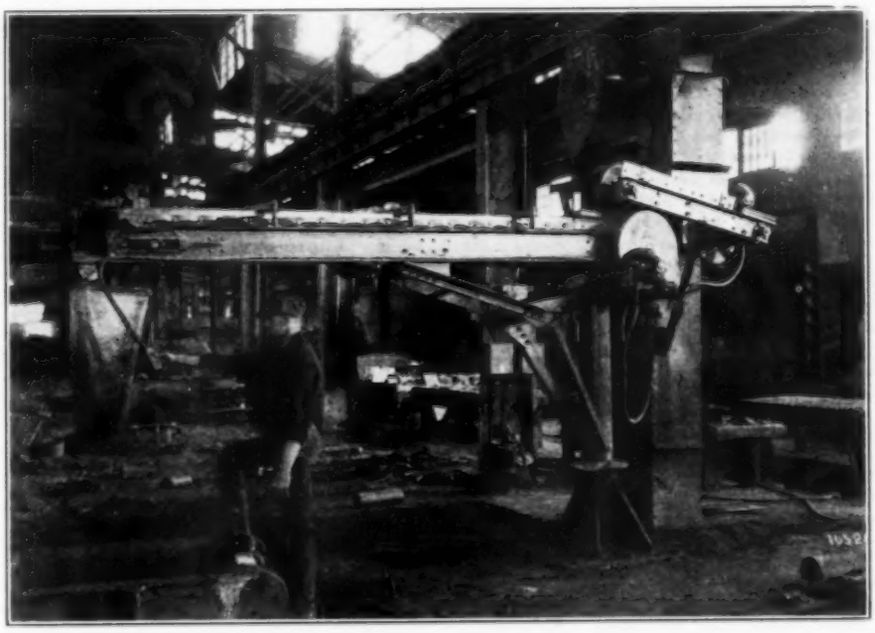
ALL WORKING PARTS ARE ENCLOSED

Riddle Parts Enclosed

A new type of sand riddle which may be secured either in the trolley or the suspended type, recently has been introduced by the Champion Foundry & Machine Co., 3018 West Twenty-first place, Chicago. The unit is built almost entirely of aluminum castings and weighs only 70 pounds complete with the motor. The motor is ¼-horsepower and travels at 1725 revolutions per minute. The motor is controlled through a conveniently located shut-off switch. All bearings and gears are lubricated through a single oil chamber. All working parts are enclosed entirely to protect them from sand and dust. The riddle or screen is held securely by a simple spring type riddle holder.

Molten Iron Undergoes Surface Change

The bureau of standards has found that at a temperature of about 1375 degrees Cent. (2500 degrees Fahr.) the character of the surface of molten iron undergoes a marked change. By applying suitable corrections for this effect the optical pyrometer becomes applicable to accurate temperature measurement in the foundry.



ELEVATORS AND CONVEYORS CARRY THE SAND FROM THE HOPPER TO THE FLASK

What the Foundries Are Doing

Reflecting the Activities of the Gray Iron, Malleable, Steel and Brass Shops

A 1-story shop addition, 30 x 50 feet, will be made to the plant of the Nekoosa Foundry Co., Nekoosa, Wis.

Dunkirk Radiator Co., Dunkirk, N. Y., has let the structural steel contract for a building to Rogers Structural Steel Co.

Lansdale Foundry Co., Lansdale, Pa., has closed its plant and will place it on the market.

Midland Furnace Co., Columbus, O., has a new building under construction on River road north of Flenniken park.

National Foundry & Machine Co., Worcester, Mass., is erecting a building, 40 x 80 feet, to take care of its increasing business.

Sibbit Iron & Foundry Co., Wichita, Kans., has received a contract to construct an airplane hangar for the city of Enid, Okla.

The addition to the Erb-Joyce Foundry Co., Vassar, Mich., now is under construction. (Noted Nov. 15.)

The foundry of the Baltimore & Ohio railroad, Newark, O., recently was damaged by fire.

Armstrong Furnace Co., Columbus, O., an outgrowth of Thomas & Armstrong, London, O., has a new plant under construction at Flenniken park, west of River road.

M. Hayman & Co., 856 East Ferry street, Buffalo, E. M. Hayman, president, has awarded the general contract for a 1-story foundry addition to H. F. Stimm Inc., Ellicott Square.

The Tampa Brass Mfg. Co., Tampa, Fla., has been incorporated with $50,000 capital to manufacture sprinkling systems, by George C. Brannon and C. E. Chalker.

American Steel Foundries, St. Louis, is replacing some of its present buildings with a new structure, 112 x 525 feet, for finishing steel castings. Erection of a building to store patterns is contemplated. (Noted Dec. 1.)

Athens Foundry Co., Athens, Pa., is building a new addition, 30 x 150 feet, to take care of its increasing business. The addition will replace a temporary wooden addition built during the summer.

Atlas Foundry Co., West Sixty-ninth street and Wheeling railroad, Cleveland, has awarded the contract for a 1-story foundry building, 30 x 90 feet, to Bolton-Pratt Construction Co., 7113 Euclid avenue.

Banner Brass Foundry, mentioned in the Nov. 15 issue of THE FOUNDRY as being located at 1807 Washington street, Cedar Rapids, Ia., instead is at East Fifth street, Cedar Falls, Ia.

Board of county commissioners, court house, Cincinnati, is planning the construction of a one-story foundry, shop and power house for county equipment to cost $200,000 with machinery.

Following the dissolution of the partnership of William A. Brooks and Hugo Mastaglio, doing business at the Brooks Pattern & Machine Co., Milwaukee, it is announced that Mr. Mastaglio will continue the business.

General Foundry & Machine Co., Flint, Mich., has been incorporated with 145,000 shares no par value stock to manufacture and deal in iron and steel and automotive supplies and accessories.

Hajoca Corp., 120 South Thirtieth street, Philadelphia, has leased property at Lewistown, Pa., for a new factory branch and distributing plant. The present building will be remodeled and other units erected.

Henry Vogt Machine Co., Louisville, Ky., has awarded general contract to H. A. Doll, Lexington road, Louisville, Ky., for a one-story machine shop to cost $65,000 with equipment.

Industrial Steel Casting Co., Millard avenue, Toledo, O., has awarded general contract to Comte-Naumann Co., 912 Summit avenue, for a one-story addition 140 x 175 feet. (Noted Dec. 1.)

Jackson Street Foundry Co., Worcester, Mass., the incorporation of which recently was announced, is not contemplating the construction of a plant or the purchase of machinery. (Noted Nov. 15.)

Keokuk Steel Casting Co., Keokuk, Ia., recently made the largest castings it ever has attempted. They weigh 5 tons each and will weigh 3½ tons when completed. They were made for the Duke Power Co., Charlotte, N. C.

Diamond Iron Works Inc., 1728 North Second street, Minneapolis, contemplates the construction of an addition to its foundry. G. A. Bingenheimer is president.

Pontiac Pattern & Engineering Co., Pontiac, Mich., recently opened its new $25,000 addition which will be used as a foundry. This company has added castings to its products of manufacture.

Rome Electric Range Co., Huntsville, Ala., which has a plant under construction announces that it will be completed by Christmas and will be in operation early in the new year.

Stark Co., Marshalltown, Iowa, W. B. Wood, manager, plans the construction of a 1-story foundry at East Linn street and South Second avenue. H. E. Reimer, Kibbey building, is architect.

The Doehler Die Casting Co., handled a record volume of business during October and its profits for the first three quarters of this year exceeded those of a similar period last year by almost $200,000.

Oakland Motor Car Co., Pontiac, Mich., has a number of building projects for which permits were issued recently, including a foundry addition, coremaking building, cupola building, cleaning building, pattern shop, sand storage building and mixing building.

Pittsburgh Foundry & Machine Co., Pittsburgh, is having plans drawn for a one-story foundry addition. Bids soon will be asked on the general contract. A. M. Tapp, Jenkins Arcade, Pittsburgh, is the architect. (Noted Dec. 1.)

Struthers Wells-Titusville Corp., Titusville, Pa., has been formed to consolidate Titusville Iron Works Co., and Titusville Forge Co., both of Titusville and the Struthers-Wells Co., Warren, Pa. The new organization will carry out a general expansion program.

The General Bronze Corp., New York, has acquired the Roman Bronze Works Inc., Brooklyn, and the American Art Foundry Inc. Astoria, L. I. The two concerns will be operated as the statuary division of General Bronze Corp.

British Maid Sales Co. Ltd., Toronto, Ont., has been incorporated to carry on the business as metal maker, manufacturer, founder and engineer, with $10,000 capital and 40,000 shares no par value stock by Alexander D. Crooks, Alan C. MacRobie and Jean C. Grant, of Toronto.

United States Radiator Corp., Philadelphia, soon will start construction of a warehouse and office building to be built at Twenty-second street and Sedgley avenue. Wark Co. has been awarded the general contract for the construction work.

Otto Biefeld Co., 202 North Water street, Watertown, Wis., which has taken the contract to manufacture a steam boiler and deconcentrator for the newly organized Henszy De-Concentrator Co., Milwaukee, is letting contracts for the erection of foundry and machine shop additions.

Precision Castings Co., J. W. Millspaugh, Keith building, Cleveland, plans the construction of a 1-story plant on Berea road to have 30,000 square feet of floor space. The general contract for the work has been let to J. O. Taylor Co., South Saline street, Syracuse, N. Y. (Noted Oct. 15.)

Rates on iron scrap, in carloads, from certain points in Oklahoma to Coffeyville, Kans., have been found unreasonable by the interstate commerce commission in a decision in the case of the Acme Foundry & Machine Co. against the Atchison, Topeka & Santa Fe railroad. Reparation has been awarded.

U. S. Brass Corp., Cleveland, manufacturer of nonferrous metals and founder, has incorporated with $25,000 capital. Robert R. Ivone is president and general manager, Ben T. Ruby is secretary and Rudy Miller is treasurer. The company has established its plant at 1276 East Fifty-fifth street, Cleveland.

Through error, it was stated in the Dec. 1 issue that the Marshall Furnace Co., Marshall, Mich., had purchased the plant and business of the Monitor Furnace Co., Cincinnati. The Marshall firm purchased the patterns, trade name and goodwill of the Monitor company. The receiver of the latter company still has a portion of the machinery and equipment for sale.

Liberty Foundry Co., Wauwatosa, P. O., Milwaukee, has acquired the McNally-Tollefson Foundry Co., Stoughton, Wis., and took possession Nov. 28. The Stoughton plant, owned by the city of Stoughton as an industrial community, will be acquired by the new owners and its capacity increased. J. E. McNally, vice president and general manager, will continue as manager of the Stoughton plant.

The Sorg Engine Mfg. Co., Flint, Mich., and Sheffield, Ala., will remove to Lawrence, Mass., and concentrate its manufacturing activities in the plant formerly used by the Brightwood Mfg. Co. The Sorg company will erect a foundry adjoining the present building. The company manufactures an engine capable of using gasoline, kerosene or ordinary fuel oil.

Mackintosh-Hemphill Co., Pittsburgh, has placed a contract with the Hughes-Foulkrod Company for the construction of a new plant at Wooster, O. When completed, it will house the heavy equipment formerly located in the Pittsburgh plant in Twelfth street, which was sold a few months ago to the Pennsylvania railroad for increased terminal facilities. The new building to be built at Wooster will be of steel frame construction and will require 400 tons of structural steel. (Noted Dec. 1.)

Miller Foundry Co., Columbus, O., recently was organized to manufacture gray iron castings. The plant's specialty will be molds for glass makers. Two buildings have been erected with approximately 10,000 square feet of floor space. They are of brick and steel construction and equipped with a 5-ton crane. The officers of the company are Edward Miller, president, Andrew G. Doll, vice president, Florian E. Miller, secretary and treasurer, Carl J. Schmiederer, foundry foreman, and Patrick J. Larkin, coreroom foreman.

AJAX PROCESS STANDARD INGOTS

Ajax Plastic Bronze
Ajax Phosphor Bronze
Ajax Red Brass Ingots
Ajax Manganese Bronze
Ajax Anti-Acid Bronze
Ajax Hydraulic Bronze
Ajax Golden Glow Yellow Brass
Ajax Manganese Copper
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Phosphor Tin

Try AJAX
on *your* formula

Competition today is keen as a razor.

To keep up in the race for business, you must keep production costs down by shaving them again and again.

Start with fundamental operations—What goes into your castings? Scrap? Cheap ingot?

On the face of it, these may seem cheap, but how many defectives do you have? That's what causes high production costs in the foundry—defectives.

For forty-eight years, AJAX PROCESS INGOTS have helped foundrymen to keep production costs low, because of the number of perfect castings they yield.

There never was a time when it was so necessary to shave production costs.

May we co-operate with you?

The Ajax Metal Company
ESTABLISHED 1880
PHILADELPHIA
OFFICES—NEW YORK CHICAGO CLEVELAND

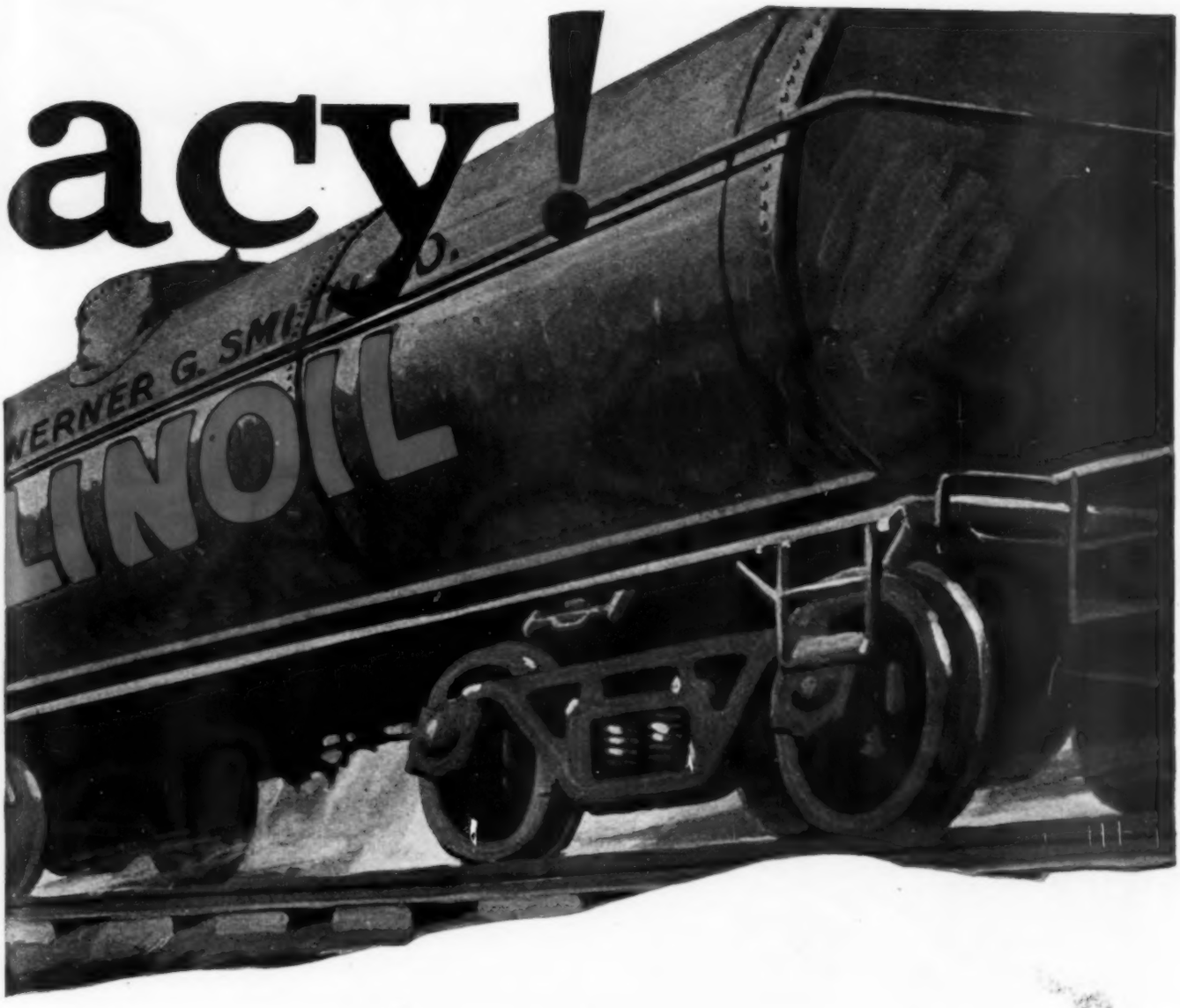
AJAX PROCESS INGOTS

Suprem

LINOIL gained supremacy in its field because it is a supremely good core oil. It retains supremacy because it maintains that goodness.

THE WERNER G.

BOSTON—141 Milk St.
BUFFALO, N. Y.—81 Linden Ave.
CHICAGO—800 North Clark St.—Superior 4797
DAYTON—125 Elmwood Ave.
DETROIT—17314 Parkside Ave.
CLEVELAND—
Cable Address "Wersmithco".



THOUSANDS of good foundrymen know the good qualities of Linoil. Naturally they use no other. No matter whether your requirements are large or small the core oil used affects your profits. It is to your own interest to get acquainted with the acknowledged leader. Let a drum of Linoil tell you its story.

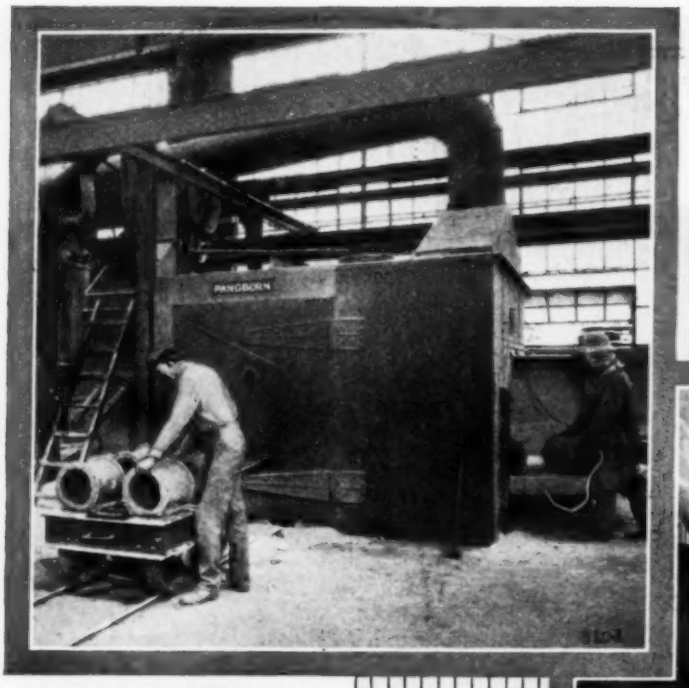
SMITH COMPANY

2191 W. 110th St.

INDIANAPOLIS—18 So. New Jersey St.
LOS ANGELES—255 E. 9th St.

PHILADELPHIA—704 Com'l Bldg.
SAN FRANCISCO—537 Second St.

Private Wires Western Union "WA" Postal 18

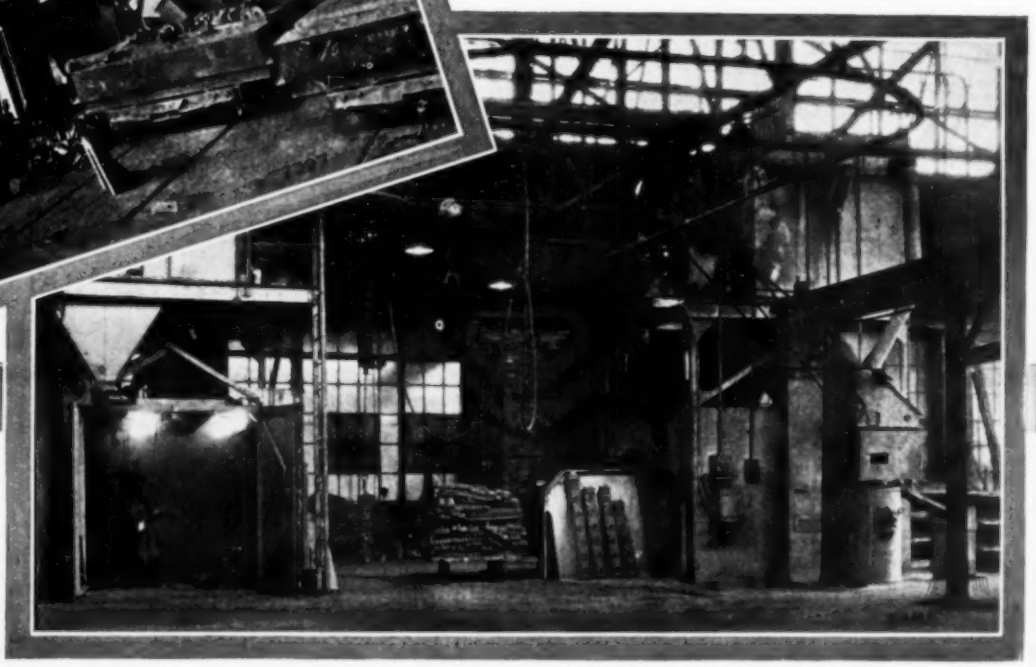


A Pangborn Sand-Blast Room with rotative table at bench height.

Pangborn Floor Level Type "EH" Hygienic Cabinet handles big work.

Two Pangborn Table Type Rooms handling 96 tons of furnace and heater castings daily.

A Pangborn Type "EH" Hygienic Cabinet in a steel foundry.



QUALITY
PC
PRODUCT

Pangborn

Table Rooms and Hygienic Cabinets Handle Big Work and Big Production

Rotative Tables that swing work to be cleaned into the Room or Cabinet, without interrupting the blasting operation for loading and unloading, increase blasting time and production.

Pangborn Rotative Tables are made for installation at bench height or floor level and in 6, 8 and 10 foot diameters. They are massive in design and construction, to withstand hardest usage and heavy work—and turn easily on large, double ball bearings.

The Pangborn Type "EH" Hygienic Cabinet has flexible Nozzle control. Every part of the work within the Cabinet is easily reached. Operator is entirely removed from contact with the dust and flying Abrasive.

Pangborn Mechanical Abrasive Separation and Reclamation System permits the use of Steel Abrasives, and assures clearer vision for the Operator thru elimination of dust created by disintegrating Sand.

Increase your production and keep your plant cleaner with Pangborn Sand-Blast Equipment.

"You may as well have the best"
5900 users can't be wrong

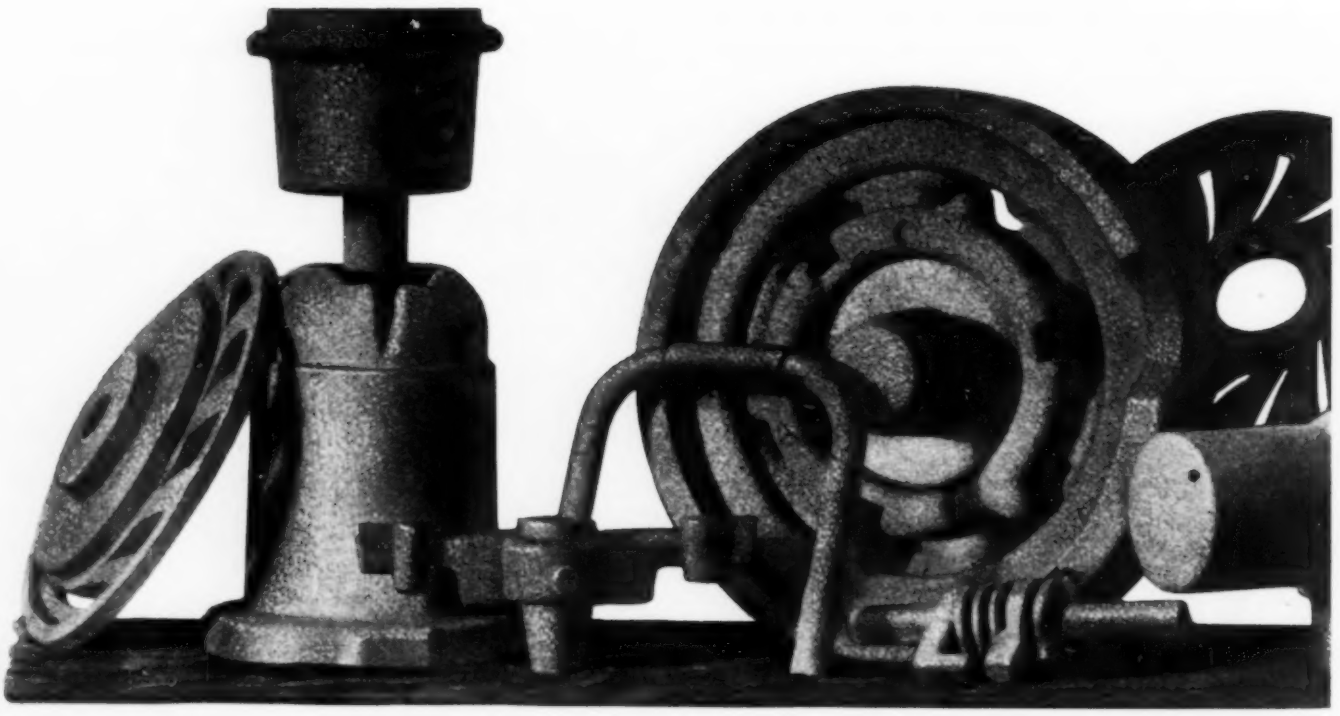
Pangborn Corporation
Sand Blast and Dust Collecting Equipment. Hagerstown, Md.

New York - - 30 Church St.
Chicago - - Railway Ex. Bldg.
Cleveland - - Penton Building
Detroit - General Motors Bldg.
Pittsburgh - Ch'ber of Com. Bldg.
Philadelphia - 1940 W. Ontario St.
Rochester, N.Y. 161 Scottsville Rd.
Boston, Chamber of Commerce Bldg.
St. Louis - - 1 Pitman Place

Distributors of "Certified" Steel Abrasives

KELLOGG'S

For Cores that must stand after baking



SCORE OILS

UNDER all ordinary changes of weather or humidity, cores made with a linseed base core oil are protected against deformation. Linseed oil resists moisture. This is especially important if the cores must stand after baking, especially if they contain other materials which absorb dampness.

Kellogg Core Oils of absolutely uniform quality, are supplied through the seventeen distributing centers listed.

Core Oil Department

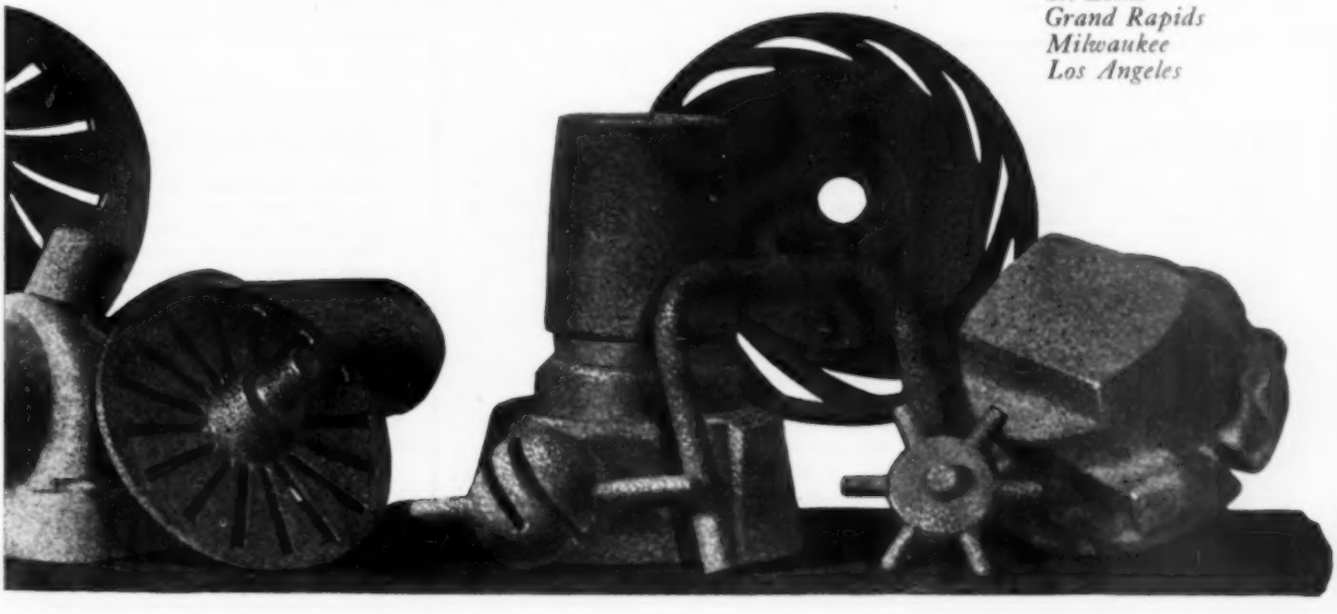
SPENCER KELLOGG AND SONS, Inc.
Buffalo, N. Y.

KELLOGG'S CORE OILS

All Kellogg Brands are linseed base core oils. We are the only manufacturers of core oils who make linseed oil.

Warehouse Points

Minneapolis
Cincinnati
Detroit
Chicago
Columbus, O.
San Francisco
Cleveland
Buffalo
Boston
New York City
Springfield, O.
Kansas City
Philadelphia
St. Louis
Grand Rapids
Milwaukee
Los Angeles



The American POLICY

THE AMERICAN MOLDER

Vol. 2 December 15, 1928 No. 4

SOME surprisingly low figures on Sand Blast Room maintenance came to light the other day at the Union Sanitary Works, Noblesville, Indiana, the only plant of its kind in the State. This plant, affiliated with the N. O. Nelson Manufacturing Co., cleans and prepares their entire production of castings for enameling in five American Down Draft Rooms.

In addition to the Noblesville Works, the parent company controls the Bessemer Soil Pipe Co., Bessemer, Alabama, the Edwardsville Brass Works, Edwardsville, Illinois, a non-ferrous foundry in St. Louis and has fifteen branch houses throughout the South, Mid-West and West. Ever since its founding 50 years ago, the N. O. Nelson Co. has enjoyed a constant expansion. In 1913 they purchased the Noblesville Plant which was founded in 1900 by the McIlwaine Richardson Company of Indianapolis, and renamed it the Union Sanitary Works. Mr. B. A. Ludlum is Works Manager.

Employing more than 250 persons, the plant covers 7 acres. The foundry, 400′ x 100′ in size, employs 75 molders and upwards of 40 tons daily are poured. More than 150 bath tubs, 400 sinks and lavatories, together with several hundred smaller and miscellaneous pieces, comprise the daily production.

Automatic unloading!
The new American Tum-Blast Cleaner affords automatic unloading, quicker blasting and greater efficiency.
Let us send performance facts obtained on gray iron, steel, malleable, non-ferrous castings and forgings.
8
Features
Quicker loading unloading
Larger capacity.
Full vision for inspection.
Speedier Cleaning
Automatic unloading.
Elimination of dead areas
High blasting efficiency.
Saves compressed air.

"REGARDING your new Tum-Blast Mill, which looked so good and unusually practical to us that we bought and installed one six months ago, we give you the following unsolicited testimonial.

"Pratt & Whitney castings are mainly for our machine tools, also making custom castings for Rolls-Royce, S.K.F. and similar important people. Our castings are of the highest quality, and must be perfectly cleaned.

"We produce about 14 tons daily of all varieties of castings ranging from 1 to 150 pounds (averaging about 25 pounds per piece), which are cleaned in the Tum-Blast Mill and finish blasting not later than 2 P. M. daily.

"Our average time to blast a full load is three minutes.

"We have not 'babied' this equipment in the least. We bought it for rough service and have so treated it without show of wear, distortion or misalignment in any of its rugged parts. When we say we like and will recommend the Tum-Blast, and are pleased and satisfied with its purchase, we mean every word of it. It has replaced two plain mills and two other pieces of blast equipment."

Each Piece Blasted Twice

Every piece must be blasted twice, once immediately after the shake-out to knock off the ½" or more of molding sand, and again after grinding to prepare the surface for enamel. Sand is used on some work, steel grit on other articles, through 2½" hose and ¾" nozzles, at an average pressure of 30 pounds.

The shake-out men truck castings from the foundry to the cleaning room, other truckers conveying them to the tables, thence back to the grinders, again to the sand blast and to the enameling room. The entire production is handled with ease in less than 9 hours daily.

Perfect cleaning of abrasive is accomplished by the Ventilating Hopper and under floor screens, notwithstanding the fact that the work is extremely dirty. Facing is not used and upwards

Use
American Flasks

American Aluminum Taper "Strip" Flasks are accurately machined, correctly tapered and possessed of proper strength to insure long life. Permit the use of your favorite pins or furnished standard with American Non-Reversible Round or Square Pins. More good molds in less time with greater profit. Write for discount buying plan.

Use
American Jackets

American Steel Plate Pouring Jackets hug the molds snugly, sealing the parting line and preventing swells. Won't burn or warp—hold their shape. Sizes corresponding with flask sizes, even inch. Companions to American Aluminum Taper "Strip" Flasks.

of ½" of molding sand adheres to all castings, yet abrasive remains clean and free from dirt.

Division of Work

Bath tubs and large sinks are handled in two 10 x 12 Rooms, each equipped with 10' Rotary Tables, on top of which are mounted 44" flat tables revolving on ball bearings. This enables the operator to spin the work around, reaching all parts of it without any lifting whatever. Pedestals, lavatories and such smaller work are handled in two 8 x 10 Rooms, each equipped with an 8' table on which the work is grouped in lots of a dozen or more pieces. Extra large pieces, such as an occasional special sink, etc., are handled in a plain 10 x 10 Room without table.

The first cleaning, direct from the shake-out, is accomplished in approximately 5 minutes for large stuff, 2 minutes for sinks, and 1 minute for lavatories, smaller pieces, such as pedestals, being blasted at a rate of upwards of 50 per hour. The second cleaning, which is simply to prepare the surface for enameling, requires approximately 2 minutes for a tub and 1 minute for smaller articles. As the average weight of a tub is 300 pounds, sinks 150 to 200 pounds and lavatories 100 pounds, the small tables mounted on the large ones are a great help to the operator in blasting larger pieces and avoid a great deal of back-breaking labor.

Features of Ventilating Hopper Favored.

The operators and master mechanic are enthusiastic over the straight down draft type ventilation which eliminates all dead spots and insures healthful working conditions, while the idea of having the pressure tank in pit underneath the Room likewise appeals to them since a great deal of room is saved and they have been enabled to line the rooms up compactly as shown. In addition, by placing the tank in the pit, gravity is made an ally instead of an enemy and automatically returns the abrasive for re-use without the aid of any mechanical devices whatever, saving a large item in power and expensive maintenance incidental to mechanical or pneumatic abrasive handling.

"Simplicity seems to be the keynote throughout," remarked the official interviewed. "The only moving wearing part exposed to the action of abrasive seems to be the mushroom filling valve which lasts for 6 months or more, can be replaced in 15 or 20 minutes and costs about $1.00."

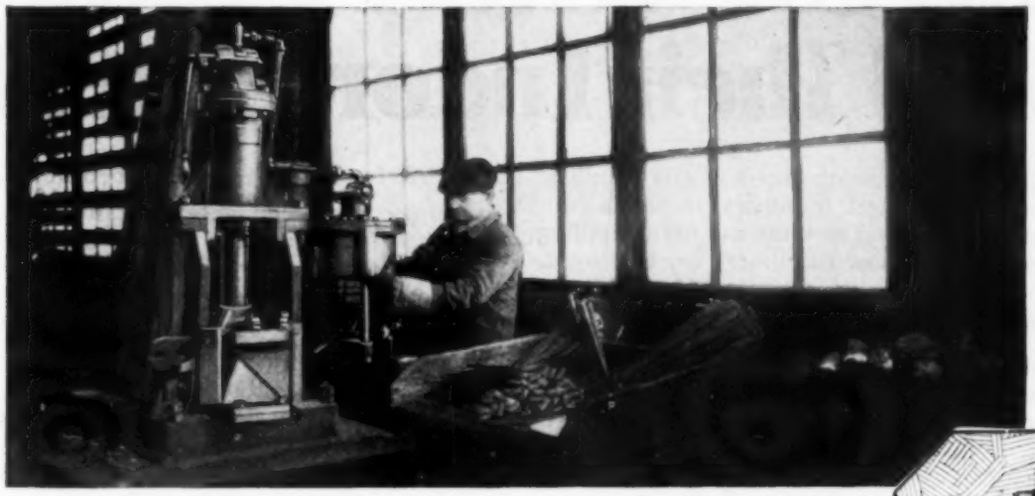
In approximately 2 years of operation none of the Rooms or the Cloth Screen Dust Arrester handling the exhaust from one battery of Rooms has ever broken down or caused an instant's trouble, but has given absolutely dependable service.

Low Maintenance Costs!

Maintenance has been exceptionally low. The entire cost for upkeep on the 5 rooms and Dust Arrester has been as follows: 1927—$169.54; 1928—$68.20.

The 492 unit American Dust Arrester handling one battery of rooms has won approval for its efficiency, dependability, low cost of upkeep and compact design which has enabled it to be installed in an odd corner which otherwise would have been waste room.

The experience of this company, who standardized on American Sand Blast Rooms after finding them the most compact, simple and scientific in design, is typical of all who employ this type of equipment. A maintenance figure as low as the one mentioned, to which the owners certify, is indeed exceptional and only possible of achievement where mechanical devices and superfluous mechanism have been eliminated through correct design such as that found in American Rooms.



American Rod Machines are built in 5 types to suit every size and class of foundry. If you are interested in savings such as those being effected by the foundry described on this page, as well as hundreds of others where these machines are installed, write us for complete information and prices.

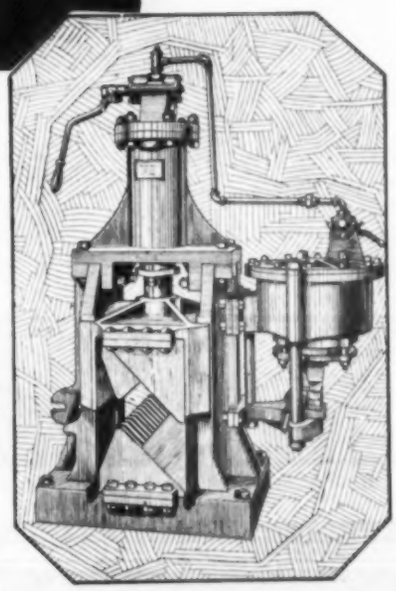
PAYING A PROFIT FOR TWELVE YEARS!

Back in the days previous to the World War, a company whose successor is the Southern Manganese Steel Company of St. Louis, Mo., installed an American Type F Rod Straightener, Shear and Gagger Machine.

For more than twelve years this unit and one man have kept this company supplied with rods and gaggers, and today with the foundry turning out some 4000 tons of Manganese Steel and FAHR-ALLOY (heat and corrosion resistant alloy) these two veterans still "hold the fort." The type of work handled in this shop requires an unusually large number of rods and gaggers on molds of medium to large size, castings averaging 800 pounds.

Rods and gaggers are made from concrete reinforcing bars with this unit, which also handles all reshaping and rebending work.

Mr. W. J. Hall, Vice President of the company, says, "The American Type F Rod Straightener, Shear and Gagger Machine displaces 2 men, saves us 300 per cent in gagger and rod cost through reduction in scrap on these items. We rework every rod 3 or 4 times, and despite our frequent overloading of this machine on work up to 1" in diameter (its rated capacity is ⅜"), we have not had to spend a single dollar on maintenance or repair. A true testimonial to our belief in this equipment will be evidenced by an order for a new large unit which will be placed the first of the year."



The AMERICAN FOUNDRY EQUIPMENT COMPANY
MISHAWAKA INDIANA
"SANDCUTTER HEADQUARTERS FOR TWENTY YEARS"

The Car Wheel Plants Add Their Endorsement

The simple, unelaborated fact is this: The major car wheel foundries, in which continuous molding systems and sand handling and conditioning machinery are employed, were almost without exception equipped by Bartlett-Snow.

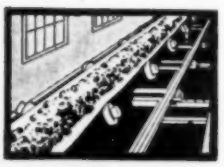
We say this with a conscious pride. It is an accomplishment to have an entire industry voice its approval. And there is good logic behind that almost unanimous selection of Bartlett-Snow equipment. The savings that come from Bartlett-Snow machinery are second to none. Nowhere will you find a sounder application of common-sense engineering to the solution of foundry handling problems.

One of the larger car wheel foundries, and one whose name appears on the opposite page, made this report after the installation of Bartlett-Snow equipment: "Our output of good castings has been doubled and our working force cut in half."

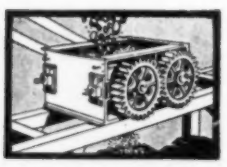
Such an economy as that is not exceptional. It is, rather, quite typical of the results obtained by users of Bartlett-Snow foundry equipment. On every class of work, mold carrying and sand handling and conditioning machinery is paying dividends that give the foundryman a new economic stability, a new margin of profit.

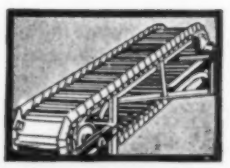
THE C. O. BARTLETT & SNOW COMPANY
6201 Harvard Ave. Cleveland, Ohio

SKIP HOIST


BELT CONVEYOR

BUCKET ELEVATOR


COAL CRUSHER


APRON CONVEYOR

. . . SAND HANDLING AND

A new bulletin, "Conditioning Sand the Bartlett-Snow Way," has just been completed. Reading it will bring you in touch with the latest foundry practice.

The installations shown on these pages are those of modern production foundries. Your own can be made like them by proper mechanical equipment. We will gladly tell you how.

These car wheel foundries are equipped with Bartlett-Snow mold carrying machinery and served by Bartlett-Snow sand handling and conditioning systems.

Griffin Wheel Company
Detroit, Mich.
Cincinnati, Ohio
Council Bluffs, Iowa
Salt Lake City, Utah
East Boston, Mass.

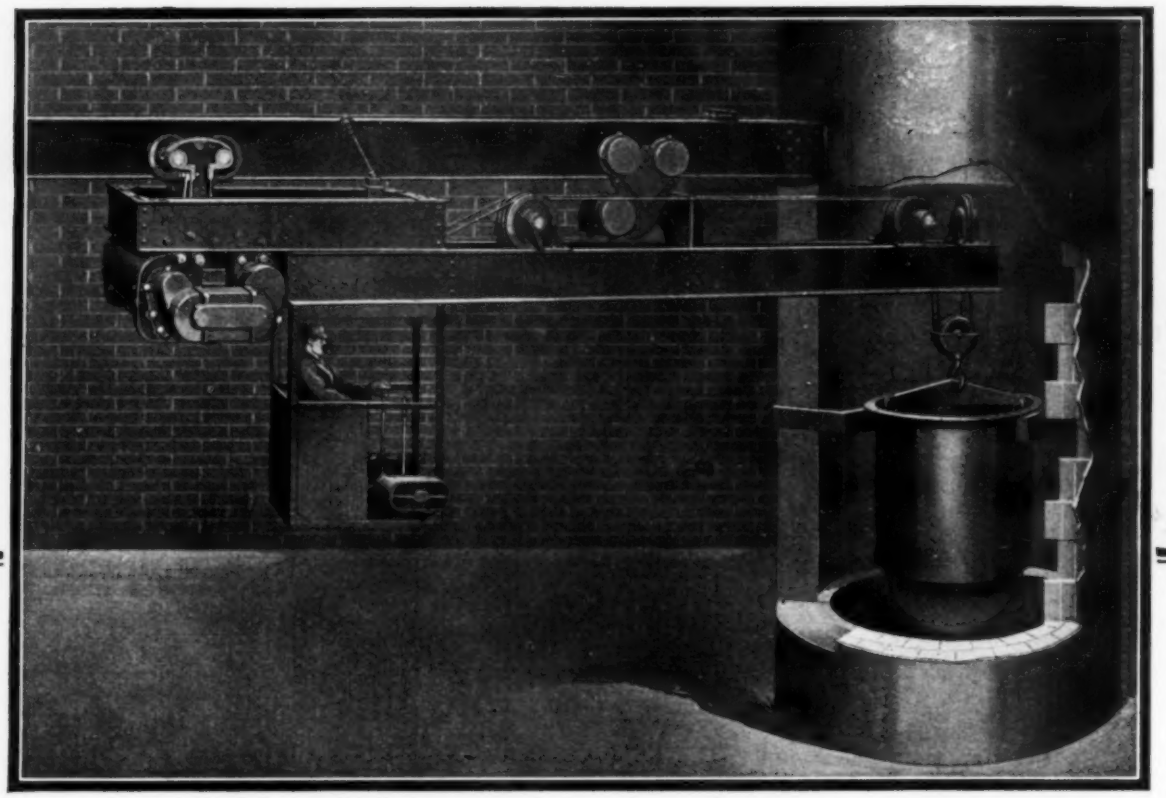
Southern Wheel Co.
Rochester, N. Y.
Toledo, Ohio
St. Louis, Mo.

Mt. Vernon Car & Mfg. Co.
Mount Vernon, Ill.

The Brown Car Wheel Wks.
Buffalo, N. Y.

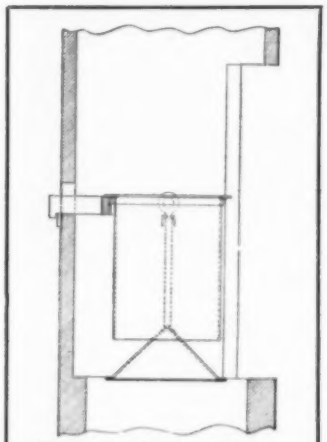
Bartlett - Snow

MOLD CARRYING MACHINERY



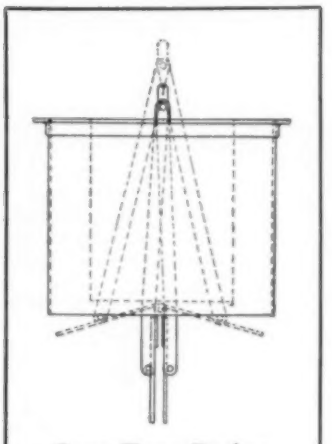
Photodiagram of Monorail type, "Wishbone" charger, with cupola wall broken away to show bucket resting on "Wishbone." We supply other types to fit your conditions.

Whiting *Wishbone* System



Controlled drop bottom type bucket

Safety, Simplicity, Speed and Control in Charging Cupolas



Cone Type Bucket.

We make special machinery of all kinds. Send us your Blue Prints or tell us the work for which you need a machine.

WHITING

Now—

Controlled Cupola Charging!

for large and small foundries

The Whiting Wishbone System provides mechanical charging with perfect control and ideal distribution of charges, automatically placing the iron charges evenly close to the cupola lining.

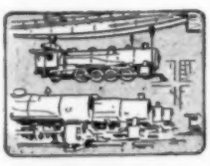
Economy of floor space has led modern foundries to adopt overhead systems wherever possible. The Whiting Wishbone applies this principle to cupola charging, using a special bottom drop bucket that cannot open unless the bucket is resting on the "Wishbone" inside the cupola, because the lift is directly on the bottom of the bucket. This feature makes the "Wishbone" system absolutely safe where the charge must be carried over the heads of workmen.

The buckets are either cone bottom or controlled drop bottom type. The simplicity of the cone type makes it ideal for large cupolas. The dump bottom bucket is better for small cupolas since it has the same perfect control features, and allows the use of a bucket almost as large as the inside of the cupola. In many cases the saving in labor pays for the installation in eighteen months to two years.

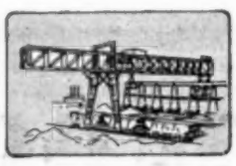
Sooner or later you will want this modern equipment in your foundry. Get full information about it now. Write today for Bulletin No. 186.

WHITING CORPORATION

15607 Lathrop Avenue, Harvey, Ill., (Chicago Suburb)



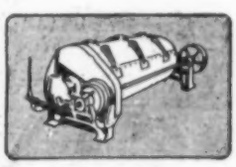
ELECTRIC TRAVELING CRANES



GANTRY CRANES

FOUNDRY CUPOLAS

LADLES



TUMBLING MILLS

DUST FILTERS

SANDSLINGERS *and* Jobbing Foundries

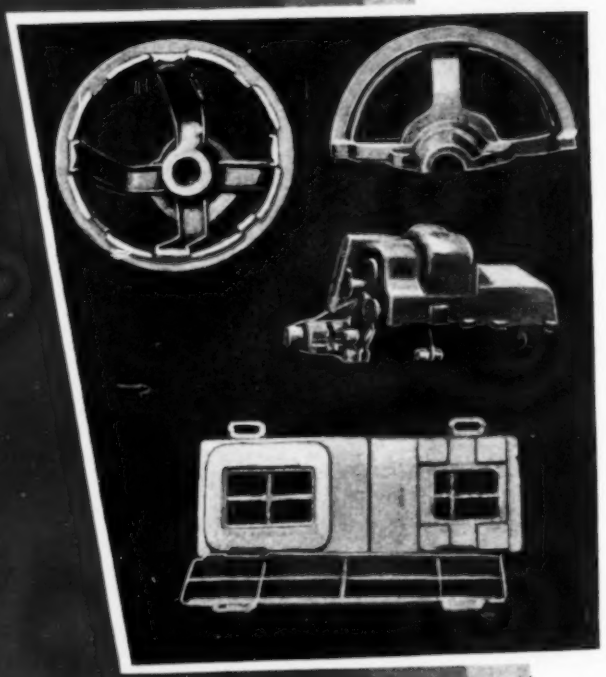
The Nickel Plate Foundry Company, Cleveland, Ohio, uses an 11′ Tractor Type *Sandslinger* to handle miscellaneous molds on jobbing work.

This is an unusual installation in that a Tractor Type Machine is being used in a jobbing foundry where wood flasks are standard equipment.

Jobs in this foundry do not run very large. One molder and one apprentice ram up all molds, keeping 9 to 10 molders busy finishing—practically all work is in green sand or skin dried molds. The *Sandslinger* cuts all the sand for a day's run in the center bay.

Here is a typical example of *Sandslinger* value in a jobbing foundry—even though castings are of miscellaneous shape and size and despite small volume, the *Sandslinger* shows a saving of 30% to 35% over former methods. Shop work has been systematized to make for greater speed and efficiency, and quality castings are now being produced with much better working conditions for the laborers.

We'll gladly send complete facts on the work of *Sandslingers* in jobbing foundries so as to give you a comprehensive picture of how this better molding method will operate and save for you. Your request for information will secure prompt attention.



The Beardsley & Piper Company

Sand Conditioning, Conveying and Molding Equipment

2541 N. Keeler Ave. • • • Chicago

Representatives in all principal foreign countries

SANDSLINGERS

The Titanium Alloy Manufacturing Co.

Niagara Falls, N. Y., U. S. A.

BRANCH OFFICES:
94 FULTON ST., NEW YORK
OLIVER BUILDING, PITTSBURGH
6007 EUCLID AVE., CLEVELAND

FERRO CARBON TITANIUM
Reg. U.S. Pat. Office Trade Mark
F.C.T.

AGENTS FOR
GREAT BRITAIN AND EUROPE
T. ROWLANDS & CO., LTD.
SHEFFIELD, ENG.

36½% of Royer Business Repeat Orders

Among the hundreds of foundries now using Royers, a great number (including many of the leaders of industry) are using from 2 to 23 of these machines. In nearly every case they started with one Royer. These continual repeat orders are the highest testimony of satisfaction, saving and service.

Thoroughly aerated sand has reduced their percentage of defective castings; thoroughly blended sand has given them clean and uniform heaps at all times; speedy sand conditioning has saved them much labor and money.

It will pay you, too, to install a "Royer". Investigate!

The ROYER
SAND SEPARATOR AND BLENDER

Royer Foundry & Machine Co. Kingston Station **Wilkes-Barre, Pa.**

Representatives

Alexander Haigh, Boston, Mass.
David D. Baxter, Rochester, N. Y.
Fenton Foundry Supply Co., Dayton, O.
Page Sales Service, 608 So. Dearborn St., Chicago, Ill.
Hill & Griffith Co., Birmingham, Ala.
Snyder Foundry Supply Co., Los Angeles, Calif.
Pacific Graphite Works, Oakland, Calif.
Western Foundry Sand Co., Seattle, Wash.

Distributed in Canada by Canadian Foundry Supplies & Equipment, Ltd., Montreal, Que. and Toronto, Ont.
Manufactured in Great Britain by Pneulec, Ltd., Smethwick, near Birmingham
Manufactured in France by Fenwick Freres, 8 Rue de Rocroy, Paris

ROYER PRODUCTS RECOMMEND THEMSELVES

To Reach The Peak Of Cleaning Room Economy

Use

Certified Steel Abrasives

They Increase Production — Do not break down, constantly retain their cutting points.

They Assure Better Finished Surfaces — Chemically clean, no dust pounded into pores of work. Produce any desired finish.

They Save Compressed Air — Give more rapid production and slower increase of nozzle opening.

They Save Blast Nozzles — Less wear on Sand-Blast Nozzles with increased life.

They Save Ventilating Costs — Create no dust, require fewer ventilation air changes than sand and less power.

They Save Dust Arrester Maintenance — Reduced load on Dust Arresters; more uniform ventilation with decreased maintenance expense.

They Save Freight, Storage, Drying & Handling—A ton outlasts a carload of sand. Occupy 1/100 the space of sand and have 2½ times the weight of sand. Packed in 100 lb. double lined bags for easy handling.

They Save Dust Disposal Expense — "A carload of sand makes a carload of dust." "CERTIFIED" Steel Abrasives make none to dispose of.

They Are Heat Treated—Not Just Dried —and have as much value over others as Malleable over Grey Iron. A certificate of test for crushing resistance is issued for every shipment.

They Reduce Cleaning Costs — Actual experience shows a saving of 50% in Abrasive cost over a year's operation. Figure this on your production.

ANGULAR STEEL GRIT **SAMSON STEEL SHOT**

Manufactured only by:

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

Steel Shot & Grit Co., Amesbury, Mass.

Certified Steel Abrasive is recommended by the leading Sand-Blast Manufacturers

LET us momentarily put aside the thought of lowering casting costs and increasing production at this season of the year when the spirit of good fellowship and brotherly love should prevail, to wish the entire foundry industry a Merry Christmas, followed by health and prosperity for the New Year for each foundryman and his family.

H. S. Simpson,
President,
National Engineering Company
Chicago, Ill., U. S. A.

DIAMOND
Sand Blast Sand
Steel Molding Sand
Silica Flour or Core Wash

The Ottawa Silica Co. process of mining, cleaning and grading is the result of many years of skilful engineering. Every Ottawa product is unusually well prepared in large modern plants and has well earned its reputation for high efficiency.

Our Engineering Department will be pleased to consult with you regarding your requirements—no obligation.

DIAMOND SAND BLAST

Ottawa Silica Co.
Ottawa, Ill.

FLINT SHOT

A manufactured product from St. Peter's rock, which has become famous for its efficiency in sandblasting. FLINT SHOT consists of round, hard, pearl-like flint granules that do not split up — they only wear down and are relatively dustless.

It is used effectively under lower pressures because its smooth pearl-like granules flow freely.

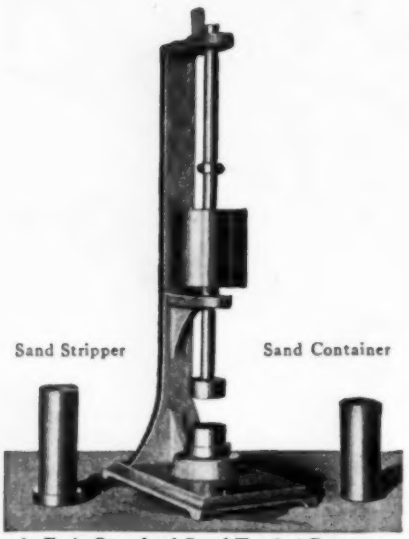
Ask for our Booklet "Sand Blasting Up to Date".

FLINT It PAYS to Use SHOT

Ottawa Silica Co.
(U. S. Silica Division)
Ottawa, Ill.

*2

You Watch Your Metal Closely--Why Not Your Sand?



A. F. A. Standard Sand Testing Rammer

Good metal alone does not make good castings. They cannot have clean, smooth surfaces unless the condition of your sand is *right*.

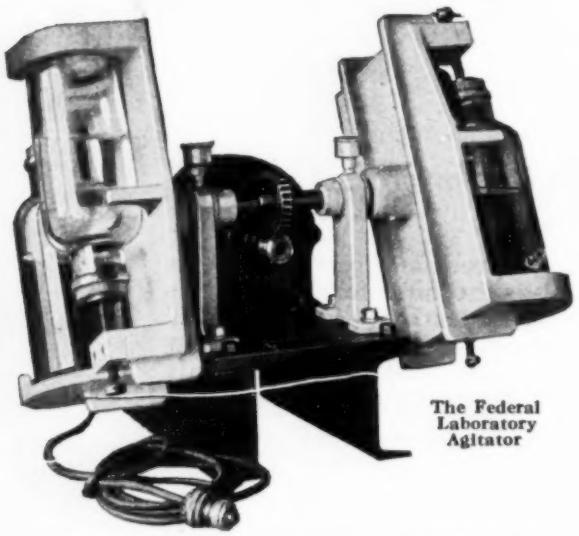
Watch your sand as closely as you do your metal, with Federal Sand Control Equipment—and get A-1 castings continuously.

For permeability and bond strength tests use our A.F.A. Standard Specimen Rammer. This device rams the specimen with greatest uniformity and accuracy.

To determine the permeability of sand use our A.F.A. Standard Permeability Machine. This machine measures, accurately, the flow of air through the sand.

For testing the Bond Strength of core or molding sand in either "green" or "dry" state, use the Federal A.F.A. Sand Strength machine which complies with the A.F.A. Standard adopted in May. It employs the A.F.A. compression method. Resistance is registered in pounds per square inch.

The Federal Laboratory Agitator is standard A.F.A. Equipment for use in connection with fineness tests of molding sand, dye absorption tests, colloidal determination of clays, etc.

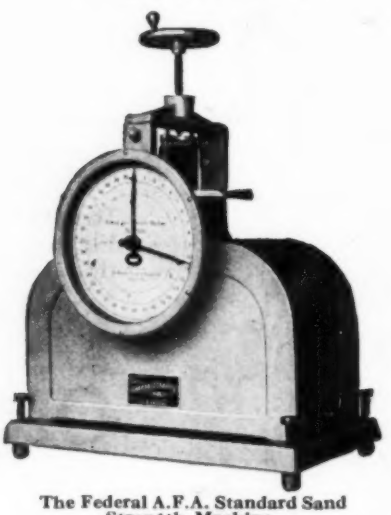

The Federal Laboratory Agitator

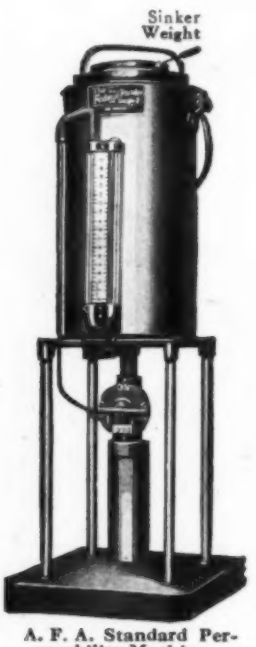
OTHER SAND TESTING LABORATORY EQUIPMENT:

Ro-Tap Testing Sieve Shaker; Standard A.F.A. Testing Sieves; Automatic Portable Electric Oven with thermostatic control; Metric 5 Kilo Capacity Balance Scale; Brass Metric Weights; Simpson Intensive Sand Mixer.

Write for our New Bulletin.

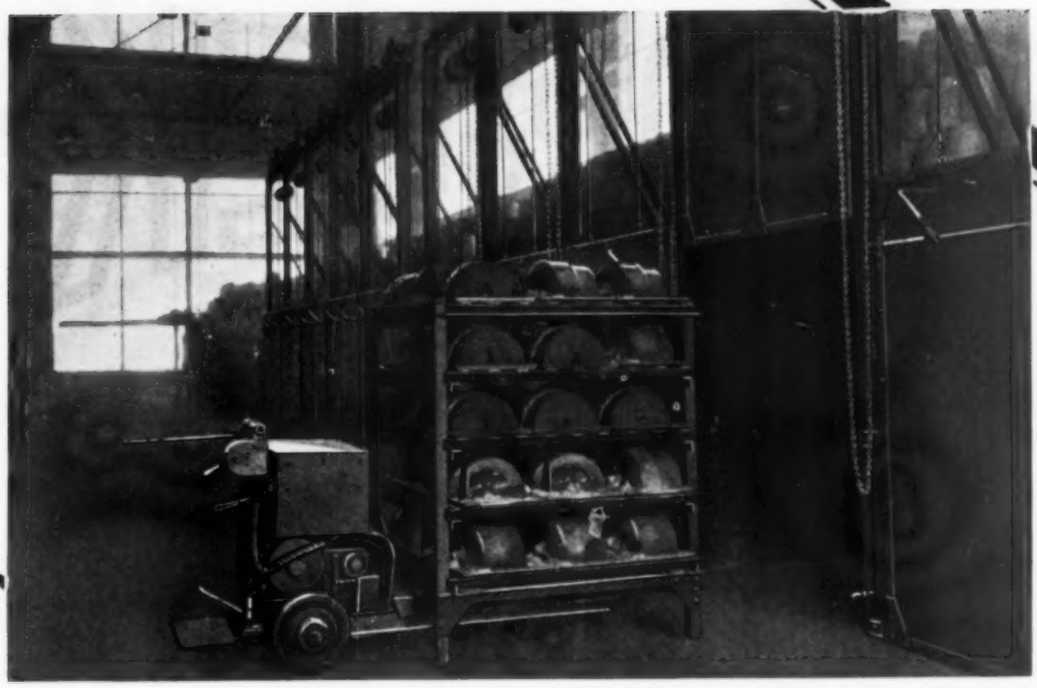
FEDERAL
Sand Control Equipment


The Federal A.F.A. Standard Sand Strength Machine



A. F. A. Standard Permeability Machine

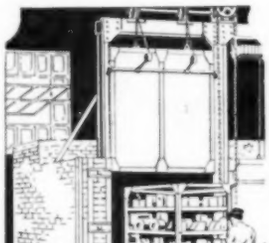
THE FEDERAL FOUNDRY SUPPLY CO.
CLEVELAND, OHIO



Showing part of over one hundred COLEMAN "Transrack" Ovens installed at foundries of General Motors Corporation.

COLEMAN

"TRANSRACK" CORE OVENS



The portable rack system of core oven operation offers many important advantages where core-room arrangement or plant layout make possible the convenient use of "lift" trucks of either the hand or power-driven types.

Core-makers can load their work directly onto portable racks which are transported when loaded to the ovens. The quick replacement of a finished rack of cores with a "green" rack load provides extremely efficient utilization of the oven capacity.

Coleman "Transrack" Core Ovens are in successful use in hundreds of foundries, from the largest production shops to the small jobbing and specialty foundries.

The Coleman heating system using any fuel—coke, oil, gas, etc., assures fast and uniform baking as well as unusual economy in fuel cost.

Our Engineering Department is at your service in the development of a core-room layout for the portable rack system of operation.

For additional information send for complete Coleman Oven Catalog F.

Coleman Ovens

Built in any type—
Portable Rack, Rolling Drawer, Car Type, Conveyor, etc.

For operation with any fuel—
Coke, Coal, Oil, Gas, Electricity, etc.

Built in any size—
To suit all core room and foundry conditions.

The FOUNDRY EQUIPMENT Co.

Builders of Foundry Ovens & Furnaces
Contracting Engineers *and* Manufacturers
CLEVELAND, OHIO

KORDEK

Reg. U. S. Pat. Off.

A Foundry Necessity that assures Quality and Economy

What It Is:

KORDEK is the highest grade dry vegetable core bond. Great binding strength, combined with utmost reliability makes it extremely economical. You will find it, always, absolutely uniform and 100% efficient.

What It Does:

KORDEK produces castings of the highest grade with the smallest percentage of blowholes and imperfections—

makes cores that have sharp edges and keep them—

bakes in the shortest time—

bakes at the lowest temperature—

increases in strength while baking—

stands up when metal is poured—

leaves a clean core box—

breaks out of castings with greatest ease—

gives off the least smoke and gas—

may be mixed in large quantities, and used as needed—

CORN PRODUCTS REFINING CO.

17 Battery Place **New York, N.Y.**

KORDEK

Reg. U. S. Pat. Off.

•3

Quality
DIAMOND
Service

Top Value in Molding Equipment

Regardless of what you desire in molding room equipment and supplies—Bands, Clamps, Core Plates, Core Boxes, Draw Screws, Snap Flasks, Master Round or Standard Hinges, Jackets, Pinch Dogs, Rapping Plates, Tongs, Wedges, etc.—*"Diamond" quality and prices are right,* and *"Diamond" service is unexcelled.* We make prompt shipment, and give special attention to telegraph orders.

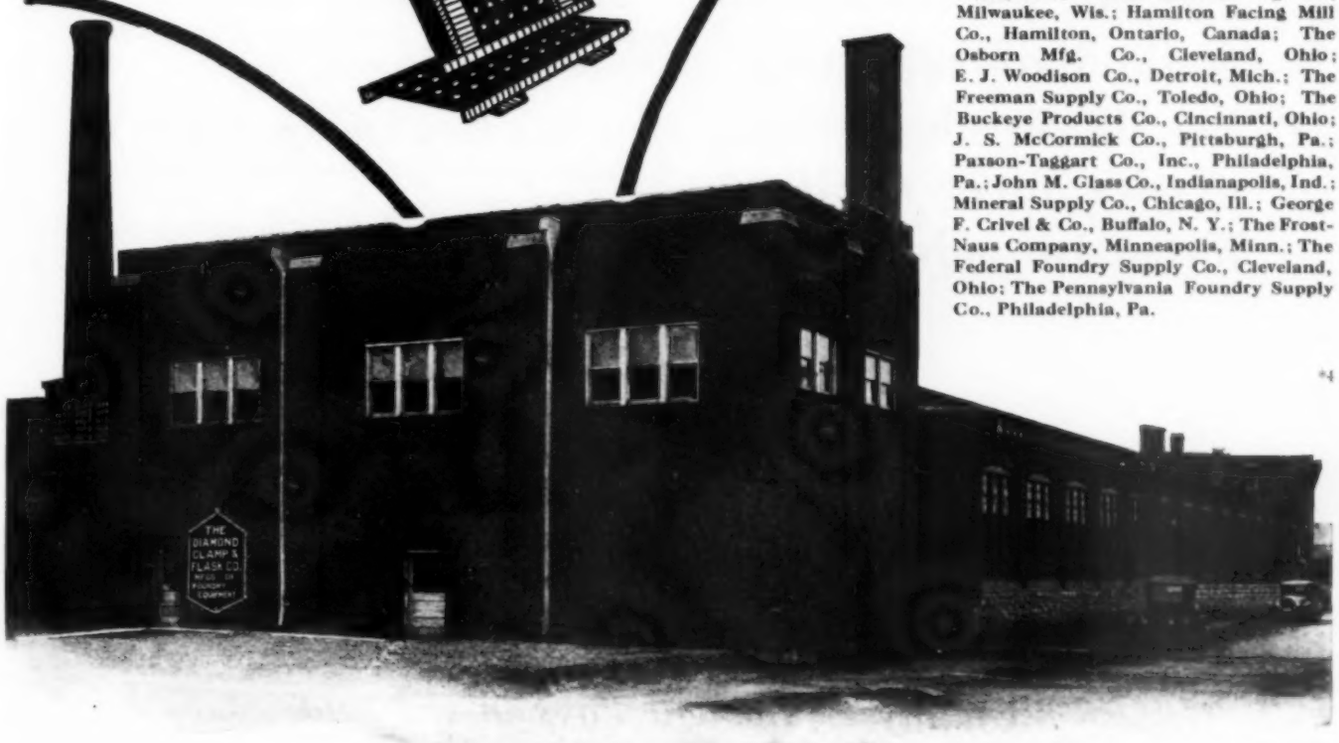
Send us a trial order today.

Diamond Clamp & Flask Co.

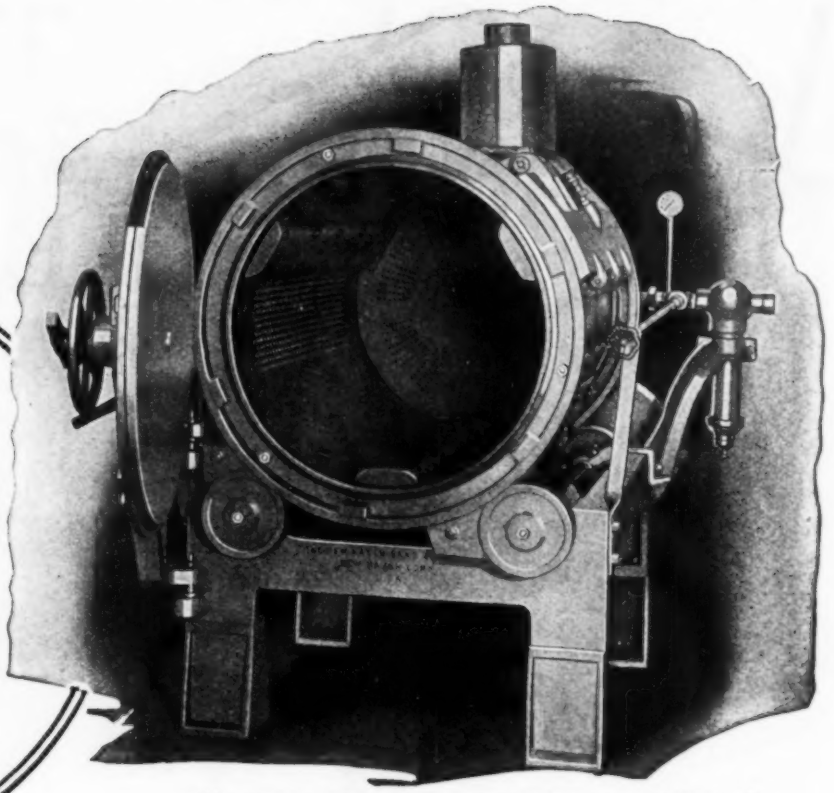
30-40 N. 14th St., Richmond, Indiana.

Chicago Office: Peoples Gas Bldg.
Telephone Harr. 7071

Frederic B. Stevens, Inc., Detroit, Mich.; Alfred T. Wagner, Detroit, Mich.; The Hill & Griffith Co., Cincinnati, Ohio; The Fenton Foundry Supply Co., Dayton, Ohio; Whitehead Brothers Co., New York, N. Y.; W. Scott Thomas, Providence, R. I.; Independent Foundry Supply Co., St. Louis, Mo.; Donald Sales & Mfg. Co., Milwaukee, Wis.; Hamilton Facing Mill Co., Hamilton, Ontario, Canada; The Osborn Mfg. Co., Cleveland, Ohio; E. J. Woodison Co., Detroit, Mich.; The Freeman Supply Co., Toledo, Ohio; The Buckeye Products Co., Cincinnati, Ohio; J. S. McCormick Co., Pittsburgh, Pa.; Paxson-Taggart Co., Inc., Philadelphia, Pa.; John M. Glass Co., Indianapolis, Ind.; Mineral Supply Co., Chicago, Ill.; George F. Crivel & Co., Buffalo, N. Y.; The Frost-Naus Company, Minneapolis, Minn.; The Federal Foundry Supply Co., Cleveland, Ohio; The Pennsylvania Foundry Supply Co., Philadelphia, Pa.



The New Haven Radial Blast Barrel



Clear loading space permits operation of barrel three-quarters full.

Features a patented principle of blasting and the self-contained method of returning the abrasive by means of the outer shell—distinctive advantages

Particularly well adapted where the range of work varies from small to large castings.

The breakage is minimized on light fragile work.

The unusually large loading capacity permits heavy charges of bulky castings.

An ideal barrel for the foundry requiring only one sand blast machine.

Operates efficiently with either sand or steel abrasive. Direct motor drive if desired.

Write for bulletin.

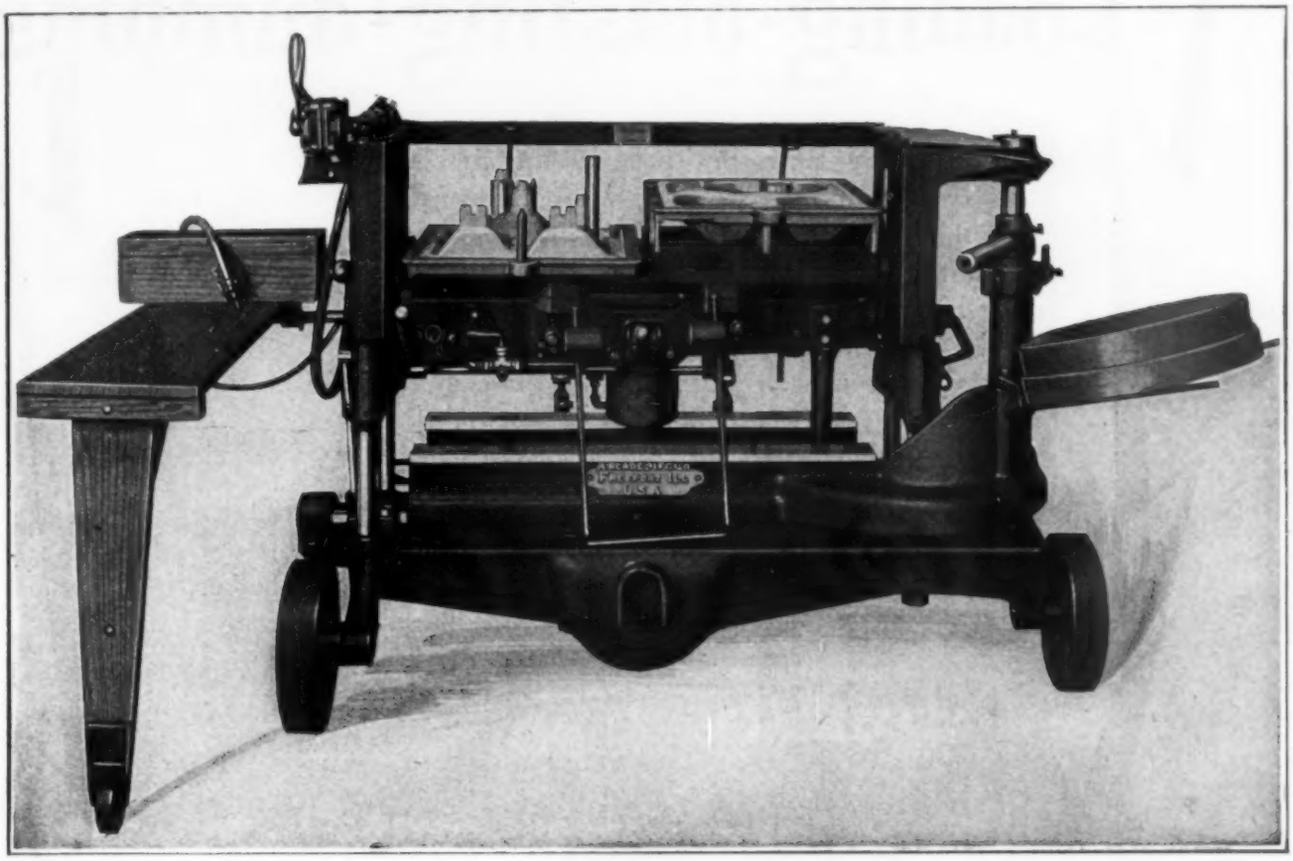
THE NEW HAVEN SAND BLAST COMPANY

New Haven Cleveland Chicago San Francisco

NEW HAVEN EQUIPMENT

"Quality Equipment Pays in the End"

ARCADE MOLDING MACHINES AND FOUNDRY EQUIPMENT



No. 110, No. 220, No. 330 Jolt Moderns

These machines are now constructed in Heavy Duty Types as per bulletin 31-A-1.

Are also constructed with power squeeze and draw less jolt. Let us tell you about it.

No obligation.

Reliable, accurate, and rugged.

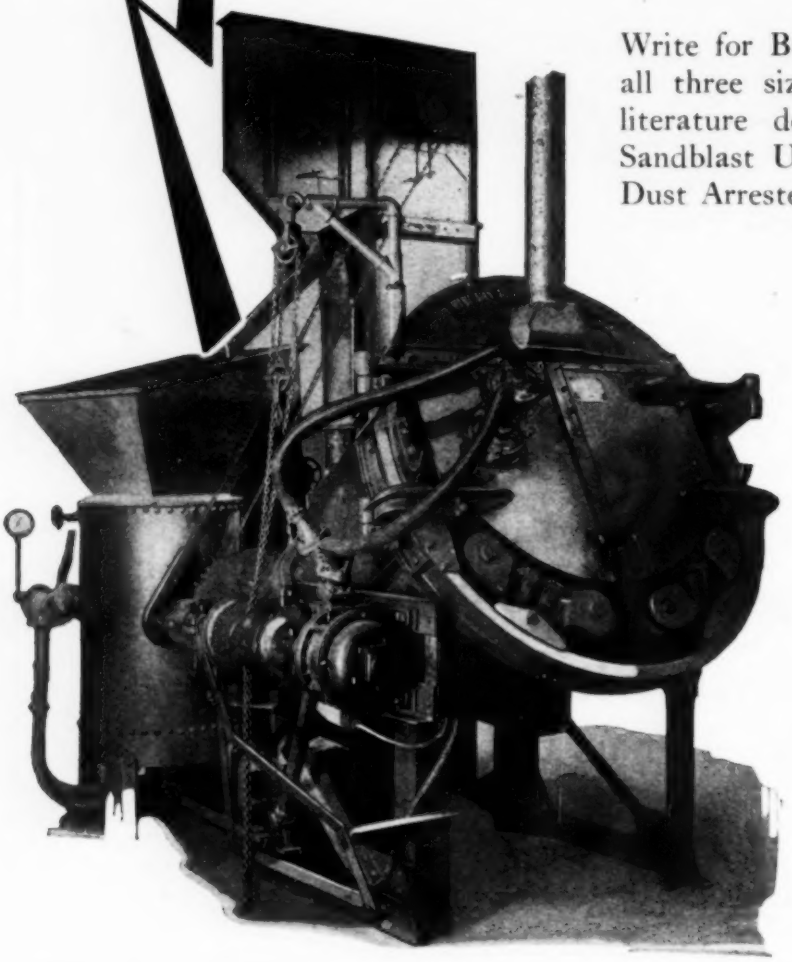
—■—

Arcade Manufacturing Company

Freeport, Illinois
U. S. A.

faster → → →
Loading-blasting-dumping

When the time comes to "speed 'er up" in your cleaning room it takes serious study to find out what kind of a sandblast machine or tumbling mill is best for your particular combination of work. The Tilted Mill is "speeding 'er up" in hundreds of foundries. Its design permits quick handling and fast blasting. The operation is simplified by the single-lever blast control and other exclusive features. It is made in three sizes to meet various production requirements.



Write for Bulletin S-136 describing all three sizes of Tilted Mills—or literature describing any type of Sandblast Unit, Tumbling Mill or Dust Arrester.

Complete Line of Cleaning Equipment

Slyblast
Rotary Tables—Tilted Mills—Rooms—Tanks—Cabinets
TUMBLING MILLS
DUST ARRESTERS
Sand Reclaiming Systems

The W. W. SLY MFG. CO.
4702 Train Ave.
Cleveland, Ohio

SLYBLAST
for Sandblast · Shotblast · Gritblast

ADAMS JOLT SQUEEZERS

are increasing production on

AUTOMOBILE MANIFOLDS

The Sibley Machine Company South Bend, Indiana, are using a battery of Adams Jolt Squeezers, Universal Type, on this work.

Mr. John Nichol, Foundry Superintendent, very kindly cooperated in furnishing this photograph with his enthusiastic comments on the results he is obtaining.

The Adams Company, Est. 1883 — **170 Foster Street, DUBUQUE, IOWA, U.S.A.**

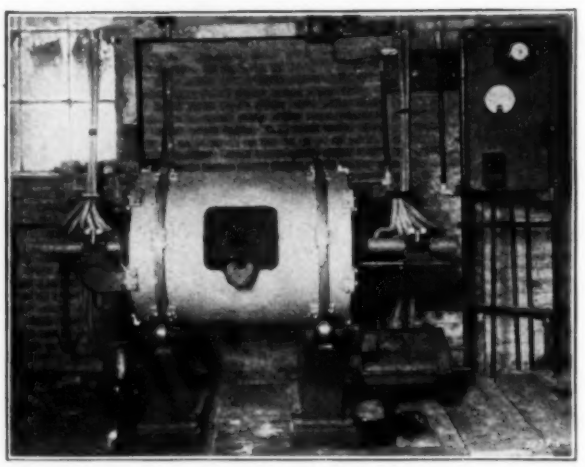
PROFITS

That's really what you're after in your foundry business,—*PROFITS!* With that idea in mind, if we can definitely show you a thirty to fifty percent reduction in melting cost together with a material increase in the percentage of good castings shipped, with lowered cost of supervision, inspection and operation, isn't that sufficient justification of a healthy interest in the use of

Detroit Electric Furnaces

"Ask the Man Who Uses One"

Quality Under Definite Control at all times

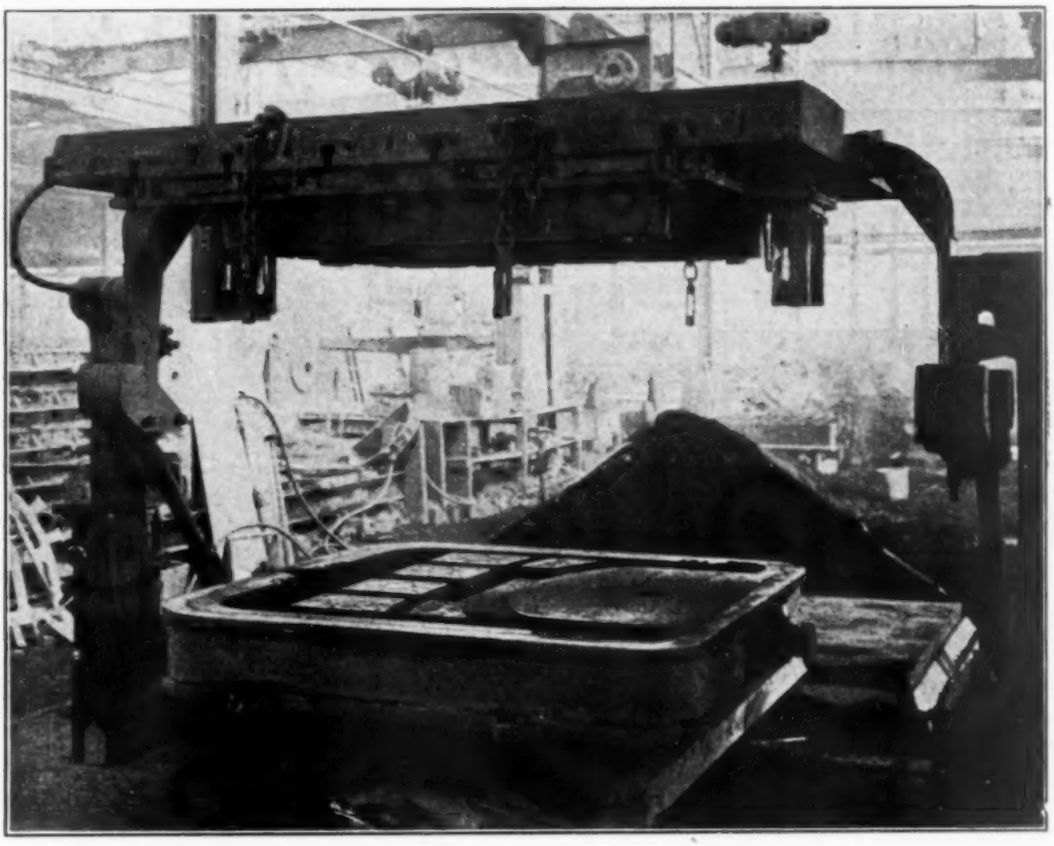


Costs Materially Lower than By other Methods

Detroit Electric Furnace Co.

Detroit, Mich. **San Francisco, Cal.**

If It's A Herman It's Worth Using. It Made Its Way by the Way it's Made



Boiler Section Work made on Herman Machines

Herman Jar Independent Rollover and Pattern Drawing Machines put *speed and efficiency* into such work as boiler sections, engine beds, cast iron columns, machine tool frames, cylinders, and all other work of medium or larger nature. *Ask users—they'll convince you.*

May we have your inquiry? Our Service Department will gladly advise you on your molding machine requirements for such work. This service is free of cost or obligation.

Herman Pneumatic Machine Company

GENERAL OFFICES: Union Bank Building, PITTSBURGH, PA.
MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U. S. A.
Foreign Works: Pneumatic Engineering Appliances Co., Ltd., Palace Chambers, Westminster, London, S. W., Eng.

*2

Plan now to attend the

Third International Foundrymen's Congress... at London... June 11 to 15

The foundry world moves to London next June to the Third International Foundrymen's Congress . . . a record attendance is expected for this important industrial event, where the officials of the Institute of British Foundrymen will be the hosts. The Lancastria sailing from New York May 31, and the Majestic, sailing June 1, arrive abroad a few days before the Congress . . .

For those desiring to combine a study of overseas foundry methods with a pleasure tour of Great Britain, we have arranged a special three weeks

OFFICIAL PRECONVENTION TOUR

sailing from New York by the

s. s. Carmania — May 10

s. s. Berengaria — May 15

Under the auspices of the Institute of British Foundrymen the American party will have the privilege of inspecting plants at Birmingham, Manchester, Glasgow, Newcastle, Sheffield, Derby . . . sight-seeing excursions to Warwick Castle, Shottery, Stratford-on-Avon, Guys Cliffe, Kenilworth Castle, Loch Lomond, Scottish Highlands, the "Dukeries", Haddon Hall, Windsor Castle . . . returning to London for the International Congress and Exhibition.

We have also arranged an attractive series of

POSTCONVENTION TOURS

of varying duration, offering an opportunity to visit the principal points of interest on the Continent

A—Paris (One week)

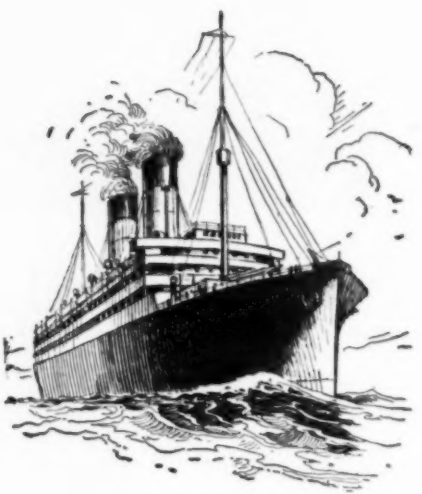
B—Belgium, the Rhine, Paris (Two Weeks)

C—Switzerland, Italy, Riviera, Paris (Four weeks)

The direction of Thos. Cook & Son, Official Travel Agents of the Tours, with their world-wide organization, 87 years of experience and 100 offices in Europe guarantee an efficient and complete service.

THOS. COOK & SON

585 Fifth Avenue **New York**



Fill out and mail coupon for full information

Mr. C. E. HOYT, Executive Secretary,
American Foundrymen's Association,
222 West Adams Street, Chicago, Illinois.

Dear Sir:—

Kindly send me Booklet No. 7 giving full information regarding the Third International Foundrymen's Congress to be held in London, June 11th, 1929, also the Official Preconvention and Postconvention Tours.

I { am / am not } a member of the American Foundrymen's Association.

Yours truly,

Name _____

Firm Name _____

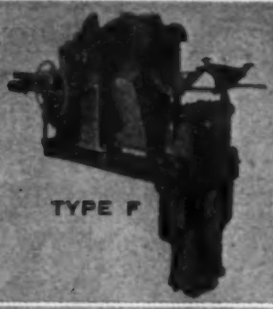
Street and Number _____

City _____ *State* _____

A-12-15

TYPE M

TYPE R
CORE SPECIAL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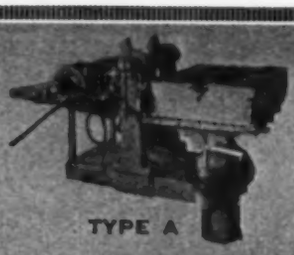
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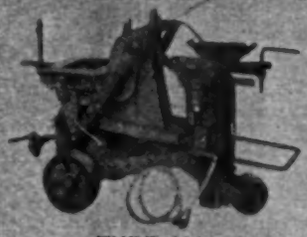
TYPE JHL

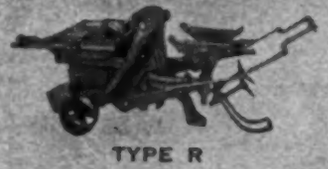

TYPE HJ

TYPE JW

INTERNATIONAL
MOLDING MACHINES

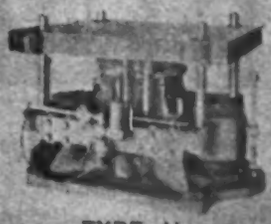
TYPE A	HAND RAMMING POWER TURN-OVER POWER DRAW MACHINE.
TYPE C	POWER SQUEEZER POWER STRIPPING MACHINE.
TYPE F	JAR RAMMING POWER TURN-OVER POWER DRAW MACHINE.
TYPE G	JAR RAMMING POWER TURN-OVER FOOT DRAW MACHINE.
TYPE GR	HAND RAMMING POWER TURN-OVER FOOT DRAW MACHINE.
TYPE H	POWER SQUEEZER.
TYPE HJ	JAR RAMMING HAND TURN-OVER FOOT DRAW MACHINE.
TYPE J	JARRING MACHINE.
TYPE JHL	JARRING MACHINE WITH HAND LEVER LIFT.
TYPE JL	JARRING MACHINE WITH AIR LIFTING CYLINDERS.
TYPE JS	JOLT SQUEEZER.
TYPE JW	JAR RAMMING HAND STRIPPING MACHINE.
TYPE JWP	JAR RAMMING POWER STRIPPING MACHINE.
TYPE K	JOLT SQUEEZER POWER STRIPPING MACHINE.
TYPE M	JAR RAMMING HAND TURN-OVER FOOT DRAW MACHINE.
TYPE R	HAND RAMMING HAND TURN-OVER FOOT DRAW MACHINE.
TYPE R	CORE SPECIAL TURN-OVER DRAW MACHINE.
TYPE R	SPECIAL HAND RAMMING POWER TURN-OVER FOOT DRAW MACHINE.
TYPE T	HAND STRIPPING PLATE MACHINE — FOR SMALL WORK.
TYPE TJ	JAR RAMMING POWER STRIPPING MACHINE.
TYPE Y	HAND STRIPPING PLATE MACHINE — FOR LARGE WORK.

INTERNATIONAL MOLDING MACHINE CO.
2608-2624 W. 16TH ST. : CHICAGO, ILL.


TYPE R

TYPE JWP

TYPE R SPECIAL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TYPE G

TYPE TJ

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TYPE J

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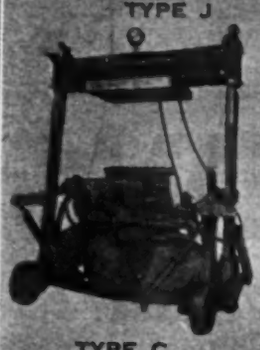
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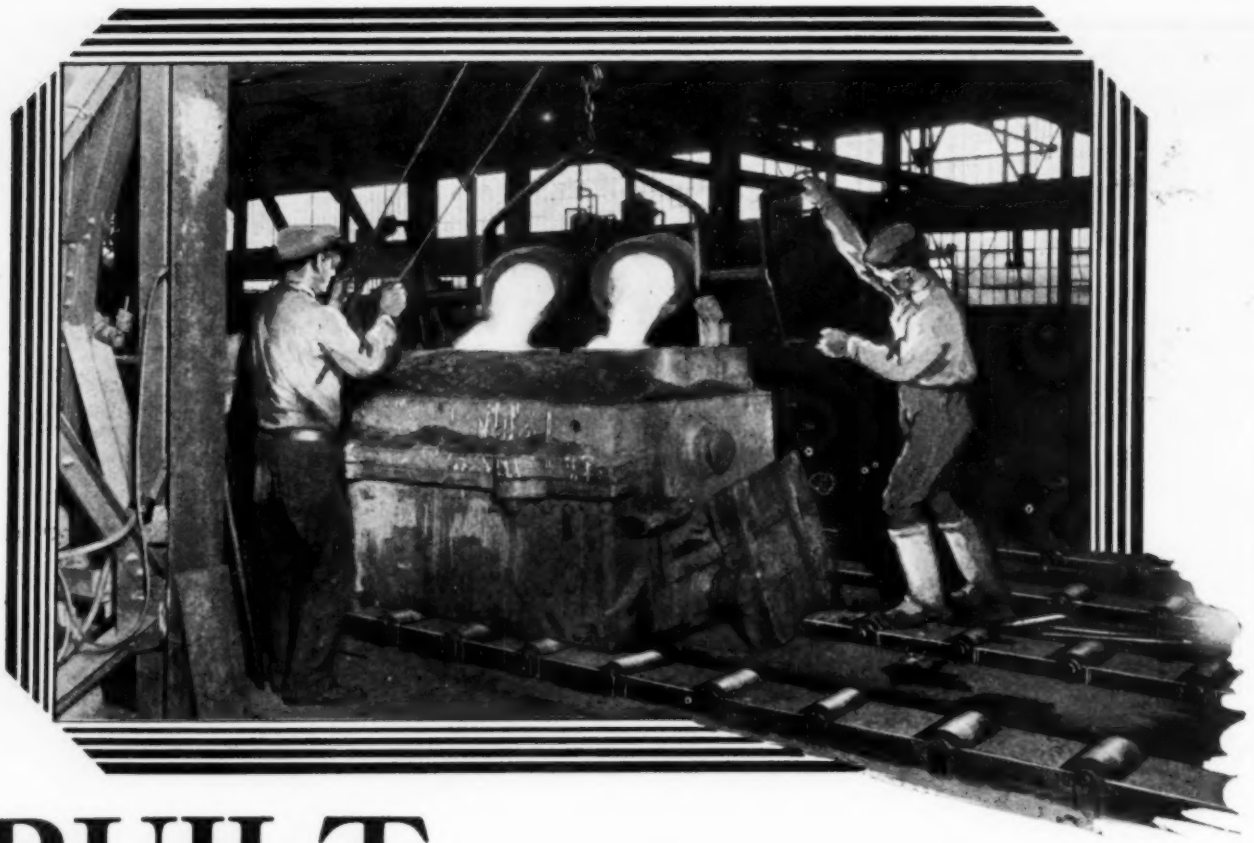


BUILT *as a*

Foundryman would specify

You undoubtedly agree with your fellow foundrymen that the first consideration in selecting a conveyer is the bearings. There's no disputing that fact . . . for the foundry conveyer must have large, sturdy bearings to support the heavy loads assigned.

Bearings in Mathews Conveyer Systems will far exceed your demands . . . for they have been built to bear unusual weight. Special construction guards them against metal spillage and abrasive action of sand. Wearing parts are of husky stock, properly hardened.

To you, and to every foundryman interested in efficient conveyers, we offer a free copy of the book "Mathews Conveyers for Foundries." In it you will find construction details of Mathews Conveyer Systems . . . the conveyer equipment that is built as a foundryman would specify.

BRANCH OFFICES at Atlanta, Birmingham, Boston, Buffalo, Charlotte, Chicago, Cleveland, Dallas, Dayton, Denver, Detroit, Houston, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, Salt Lake City, San Francisco, Seattle. Mathews Conveyer Company, Ltd., Port Hope, Ont.

MATHEWS CONVEYER COMPANY,
104 Tenth Street, Ellwood City, Pa.

MATHEWS CONVEYER COMPANY
104 Tenth Street, Ellwood City, Pa.

Send us a free copy of the book "Mathews Conveyers for Foundries."

Signed .....

Firm .....

Address .....

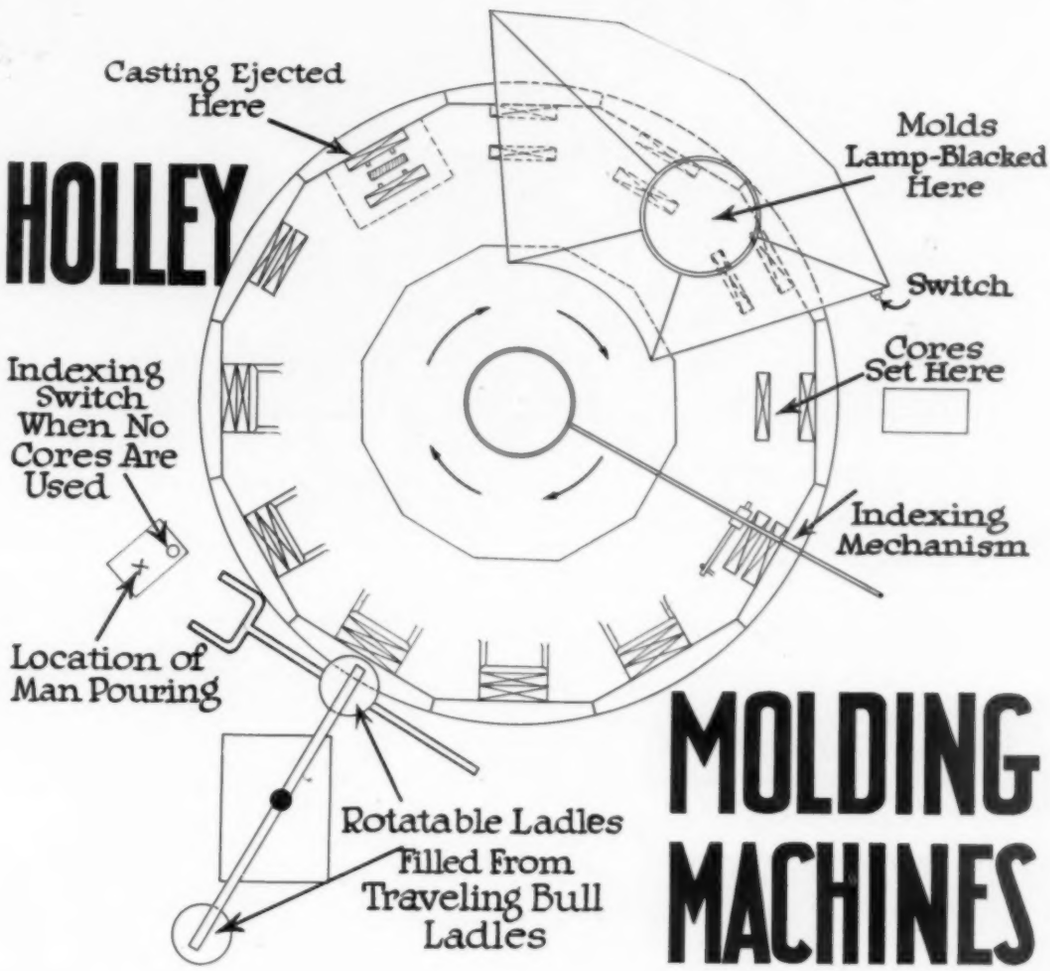
City ..... State .....

( ) *Check here if you would like a Mathews Engineer to call*

MATHEWS
Conveyer Systems
Increase Plant Profits

Make Grey Iron Castings in Permanent Molds

for Low Cost and High Quality



USING ordinary standard scrap and pig irons mixtures in the Cupola and operating with normal cold air low blast, but pouring into iron molds, a much better quality of castings will be obtained than can be obtained by using more expensive mixtures and casting in ordinary (cold) Sand Molds.

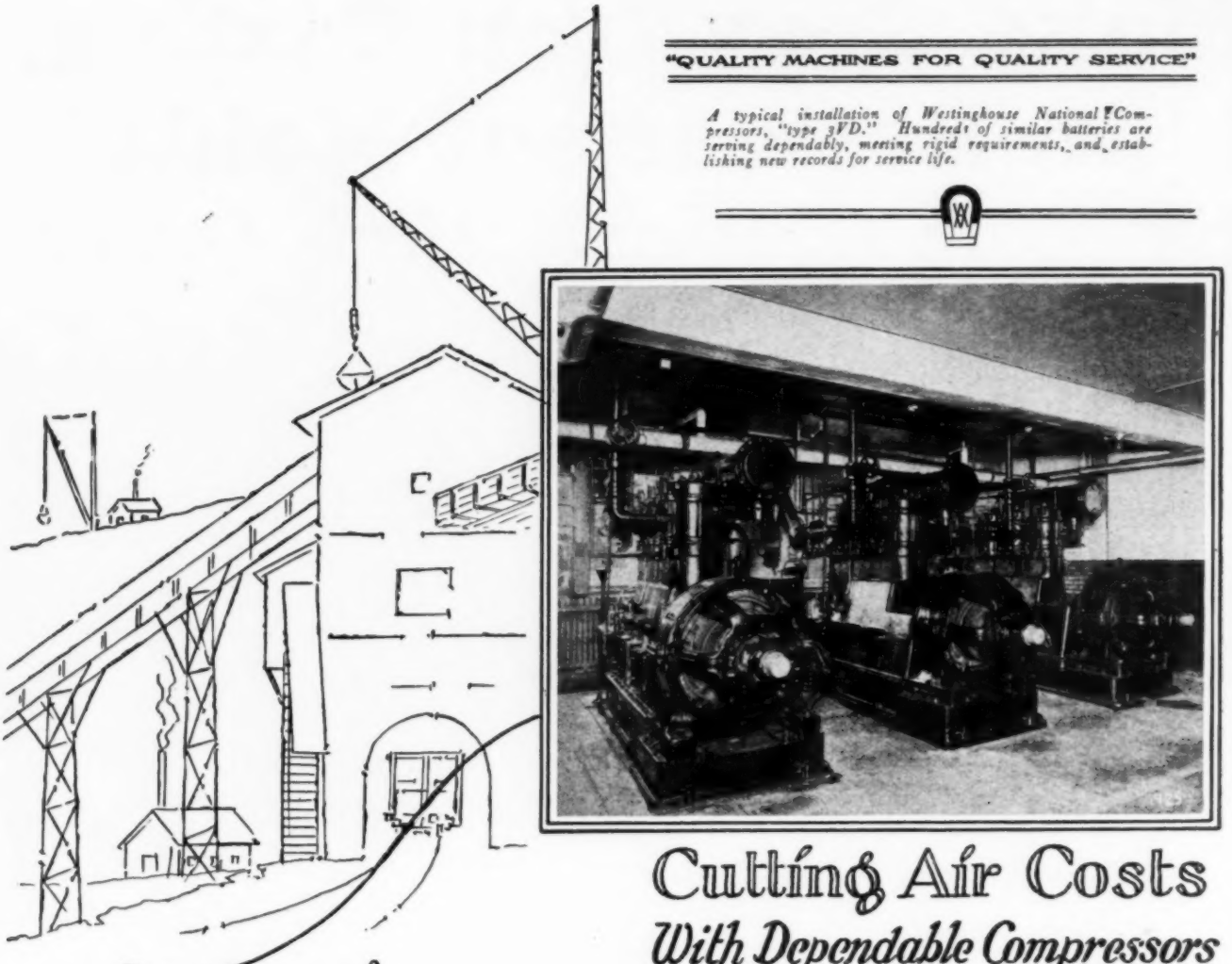
Besides improving the quality of the castiron castings, the use of permanent Iron Molds affords a definite saving in the manufacturing cost of almost any kind of casting. The Permanent Iron Molds are mounted on efficient turntable machines, as shown above. For small production, hand machines are sold.

We will be delighted to discuss with you your casting problems, many of which we believe we can help you solve.

HOLLEY PERMANENT MOLD MACHINE, INC.
DETROIT, MICHIGAN

"QUALITY MACHINES FOR QUALITY SERVICE"

A typical installation of Westinghouse National Compressors, "type 3VD." Hundreds of similar batteries are serving dependably, meeting rigid requirements, and establishing new records for service life.



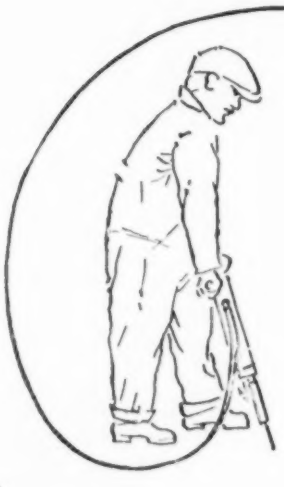
Cutting Air Costs
With Dependable Compressors

Each compressor in the "Westinghouse [National Line" embodies the features and refinements that have come from over a half-century of research and development. Their exclusive control feature automatically stops the compressor when the desired pneumatic pressure has been attained, and cuts in at once when usage has reduced the pressure to minimum . . . ***they never idle.*** In addition to this notable economic feature all "Westinghouse Nationals" are protected against injury, due to lack of lubrication. Before the oil in the crank case is permitted to reach the danger level, the power is cut off by the unique control feature.

We will be glad to furnish complete information concerning Westinghouse National Compressors. . . There is a type for every service.

WESTINGHOUSE TRACTION BRAKE CO.
Industrial Division
General Office and Works: Wilmerding, Penna.

Westinghouse National

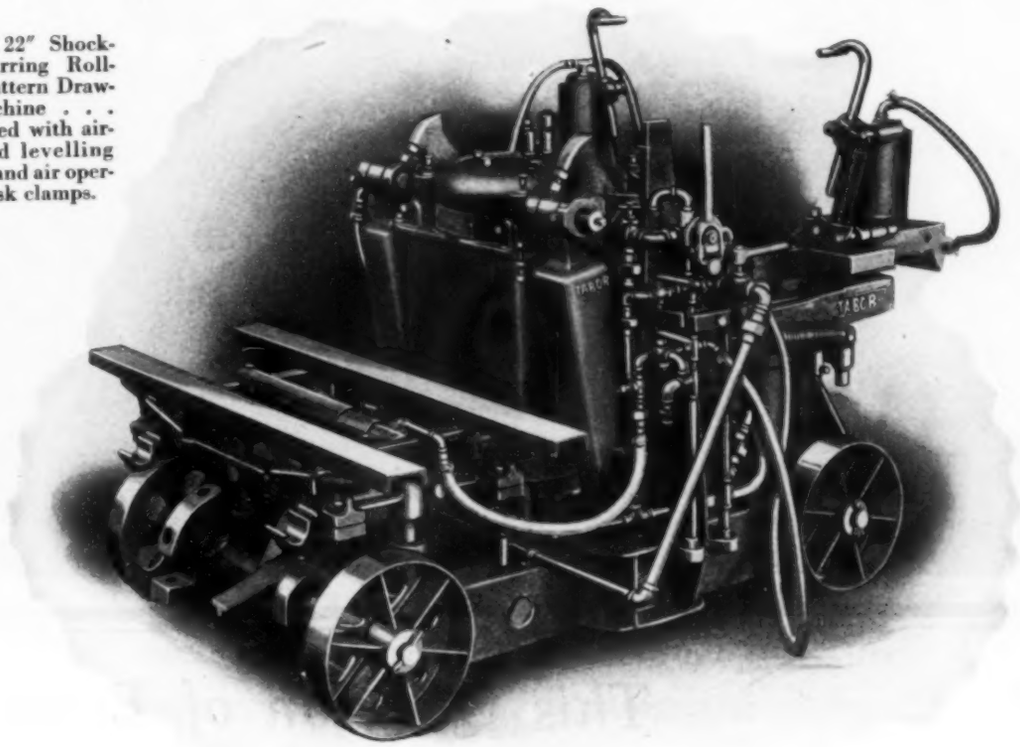


9022

WESTINGHOUSE—NATIONAL
Air Compressors

Air Levelling and Air Clamping are Now Features of the TABOR Jar Ram Rollover Molding Machines

TABOR 22" Shockless Jarring Rollover Pattern Drawing Machine . . . Equipped with air-operated levelling device and air operated flask clamps.



MORE MOLDS AND BETTER MOLDS!

THIS popular machine has been improved further—in both plain jarring and shockless jarring—by changing the hand levelling device to air-operated, controlled from the operating stand. (This improvement also is incorporated in all Tabor Jar Rollover Machines.)

Automatic air clamps also can be supplied at reasonable cost.

On machines so equipped, the operator is not required to leave his position at the valve stand while the machine is going through its complete operation. *After the flask is filled, the operator walks to the machine once—not around the machine often.*

The extremely short time required to ram the mold by means of the characteristically efficient Tabor jarring blow—together with the high speed rollover, mechanical levelling, and "air on oil"-controlled pattern draw—assures this machine of producing *more and better molds.*

WRITE US FOR DETAILS SPECIFICALLY APPLYING ON YOUR WORK!

THE TABOR MANUFACTURING COMPANY

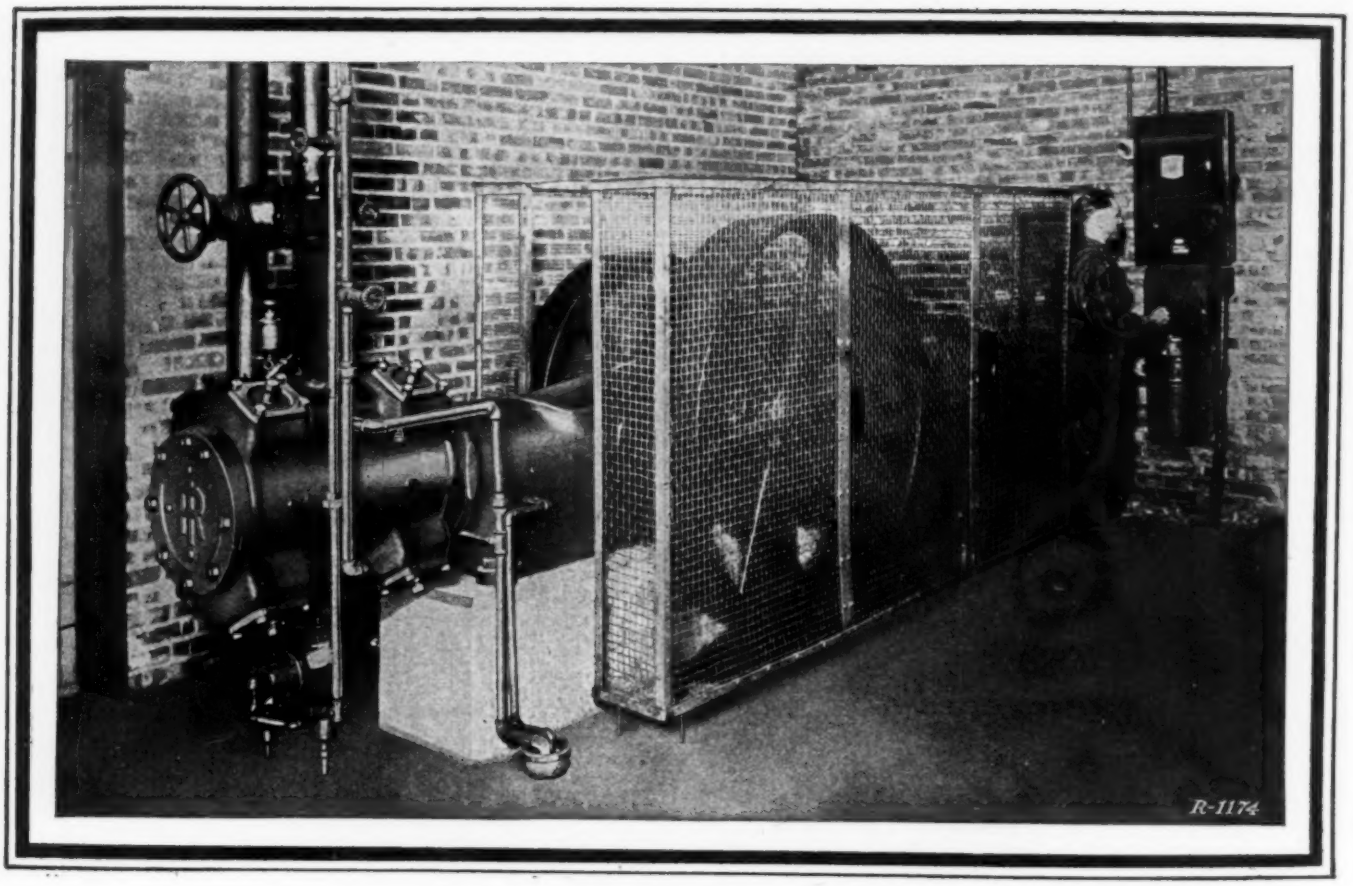
6225 TACONY STREET · PHILADELPHIA, PENNA.

Western Representatives:

Northern California: PACIFIC GRAPHITE WORKS, Oakland, Cal. *Southern California:* SNYDER FOUNDRY SUPPLY CO., Los Angeles, Cal.

Foreign Representatives:

Great Britain and Ireland: MACNAB & CO., 56 Eagle St., Southampton Row, London, Eng. *Japan:* MITSUI & CO., Tokio, Japan
European Continent: F. G. KRETSCHMER CO., Frankfort, A. M., Germany
Australasia: BENSON BROS., LTD., Sydney, Australia



An installation of ER Compressor

This Question of Economy

Ingersoll-Rand Air Compressors are the finest built. Many years of experience have taught our engineers the mechanical secrets of design. Long periods of experiment have shown our shopmen the secrets of machining and construction. And a great many years of hard, continuous service have proved to our customers that our design and construction are right.

The manufacturer who builds absolute dependability into his product does not sacrifice quality in an attempt to cut his costs. The money that he spends for high-quality materials and workmanship makes his machine a gilt-edge investment for the customer, who collects daily dividends in economy and dependability.

We have trained engineers located in the principal cities of the world. They will give you expert service and will help you with your compressed air problems.

Domestic Branches:

Atlanta
Birmingham
Boston
Buffalo
Butte
Chicago
Cleveland
Dallas
Denver
Detroit
Duluth
El Paso
Honolulu
Knoxville
Los Angeles
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New Orleans
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Philadelphia
Picter
Pittsburgh
Pottsville
Salt Lake City
San Francisco
Scranton
Seattle
St. Louis
Washington

INGERSOLL-RAND COMPANY

11 Broadway — New York City

Offices in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited, 10 Phillips Square, Montreal, Que.

836A-C

Ingersoll-Rand

The K-B Trade-Mark

Is the purchaser's guarantee of the utmost in core binder quality and the topmost in workability. This trade-mark appears on each bag of core binder manufactured by this company and is a safeguard against substitution.

Stocks carried at all principal points.

Knefler-Bates Manufacturing Company

Indianapolis, Ind.

Distributing Warehouses located in all principal American Cities

Agents for Great Britain: Yorkshire Amalgamated Products, Ltd., 27 Waterdale, Doncaster, England

Agents for Scandinavian countries: Otto Madsen, Copenhagen, Denmark

K-B Core Binder and Facing Flour

CVRTIS HOISTS CRANES

This instance happens to be a garage but similar savings are made in factories

A large packing company (name on request) tells us it is handling all service on 24% more trucks with 33% less men because of the two Curtis Air Cranes installed in its garage.

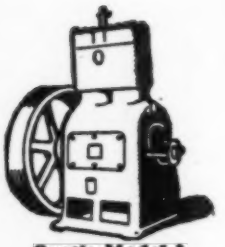
"It required three men," they say, "to do the service and repair work on 34 cars. The Curtis cranes enable two men to do all the work, although our fleet has increased to 42."

These cranes are 36 foot span and operate on 60 foot tracks. Their rated capacities are 6,000 and 3,000 pounds. "But," says the owner, "both have a good margin over their rated capacities."

In these advertisements we are piling instance upon instance, giving evidence of time and money savings in all kinds of factories, foundries, yards, etc., where Curtis air hoists and cranes are replacing other forms of power lifting equipment.

Frequently the whole Curtis installation costs less than the controls on some other type of lift. Yet the sturdy construction, the simplicity of air hoists keep maintenance cost far below that of the more complicated equipment.

Why not write today for whole story including bulletins and costs?

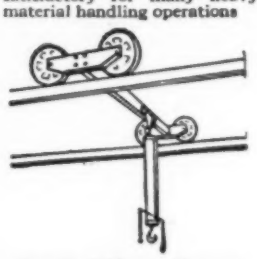


Curtis Model A Compressors

3 to 50 H. P. Water cooled. Curtis controlled splash lubricating system assures lowest oil consumption with certainty of safe lubrication.

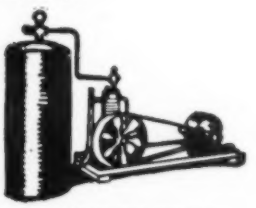
Curtis Air Hoists and I Beam Trolleys

Much lower cost than other types of power hoist. Slow depreciation, practically free from upkeep expense. Quick, accurate spotting. Economical to operate. Mounted vertically, horizontally or otherwise. Most satisfactory for many heavy material handling operations



Curtis I-Beam Cranes

10 to 40 ft. span. ½ to 10 ton capacity. Fitted with air hoist, gives all the above advantages of speed and economy plus great flexibility.



Curtis Paint Spray Compressor

¼ to 5 H. P. Single or two-stage. Automatic control. Recommended by leading manufacturers of spray guns because controlled splash lubrication prevents clogging of filters; minimizes chance of lubricating oil getting over into air lines.

Curtis
ST. LOUIS

Gentlemen:
Please send me, without obligation, information about
.....
.....
Name.....
Address.....
City.....State.....

C4

CURTIS PNEUMATIC MACHINERY CO., 1943 KIENLEN AVE., ST. LOUIS; 518-O HUDSON TERMINAL, NEW YORK

The Oldest Oil Company in America
makes
Core Oil For Every Foundry Purpose

AMONG the nine grades of Noscale Core Oils is one which is exactly suited to your work. Our representatives are thoroughly qualified to study your work and determine the specific core oil best suited for your purpose.

Your acceptance of this offer to make a survey of your core oil requirements entails no obligation. Address the nearest of our nine offices.

Wm. C. Robinson & Son Co.
Baltimore, Md.

Boston	Philadelphia	Chicago	Norfolk
New York	Pittsburgh	Detroit	Charlotte

"Who is *that* man?"

"This is Mr. Robertson, Consulting Engineer of The Linde Air Products Company," said the Chief Engineer.

"When we found that our latest alloy required an entirely new procedure for welding, we called the Linde Company for help. They submitted the problem to their Research Laboratories, who have worked out a way to weld this new alloy successfully.

"Mr. Robertson has furnished us with what they call a Procedure Control—detailed instructions for doing the work. These are specimen welds made by their new method. We've just finished testing these coupons for tensile strength. Every one broke outside the weld at a figure far beyond our maximum requirements."

HUNDREDS of practical and theoretical problems involving the Oxy-Acetylene process are constantly being studied in the Union Carbide and Carbon Research Laboratories. The results of these studies as well as help on any special problems that may come up are available to Linde customers through Linde Process Service. Linde Process Service is one of the reasons that Linde Oxygen is the leader in its field.

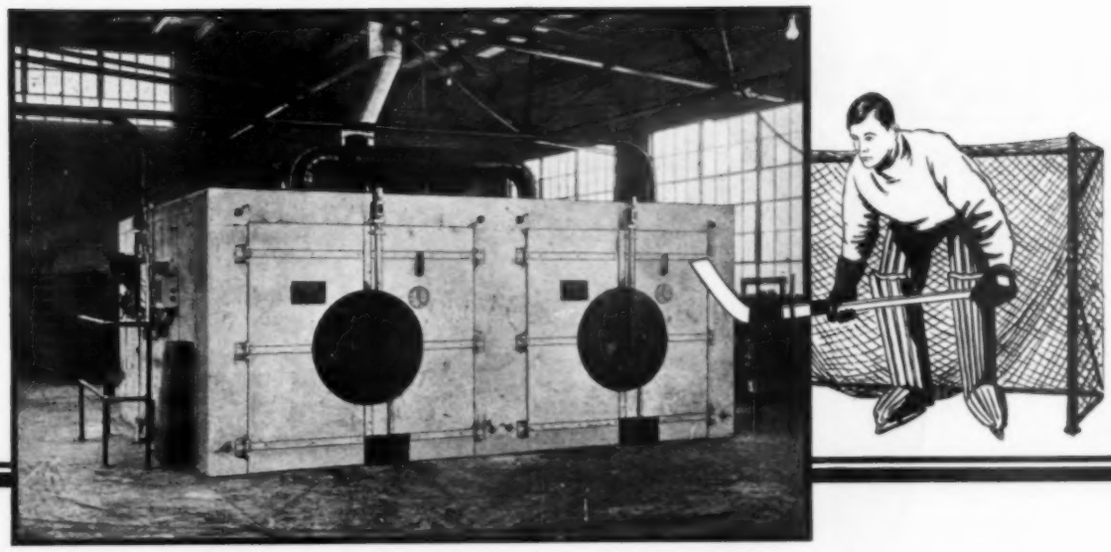
THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide UCC *and Carbon Corporation*

General Offices: Carbide and Carbon Building
30 East 42d Street, New York

54 PLANTS · 98 WAREHOUSES

LINDE OXYGEN



Insulated *for the* Job

Watch the goal tender as he skates back and forth before the hockey net. Note how thoroughly he has insulated himself for his dangerous job.

A hard shot by one of the players and the disc flies through the air. Striking a thick leg-guard, it falls to the ice without doing harm . . . its attack quite as futile as the attempts of heat to go through the resistive walls of a Swartwout Metal Insulated Oven.

Padded generously with heat-resisting composition, the steel panels of Swartwout Ovens form an impenetrable barrier . . . confining heat to its task. Neither can heat creep from panel to panel, for the Swartwout Stop-Gap Joint allows no metal connection between units.

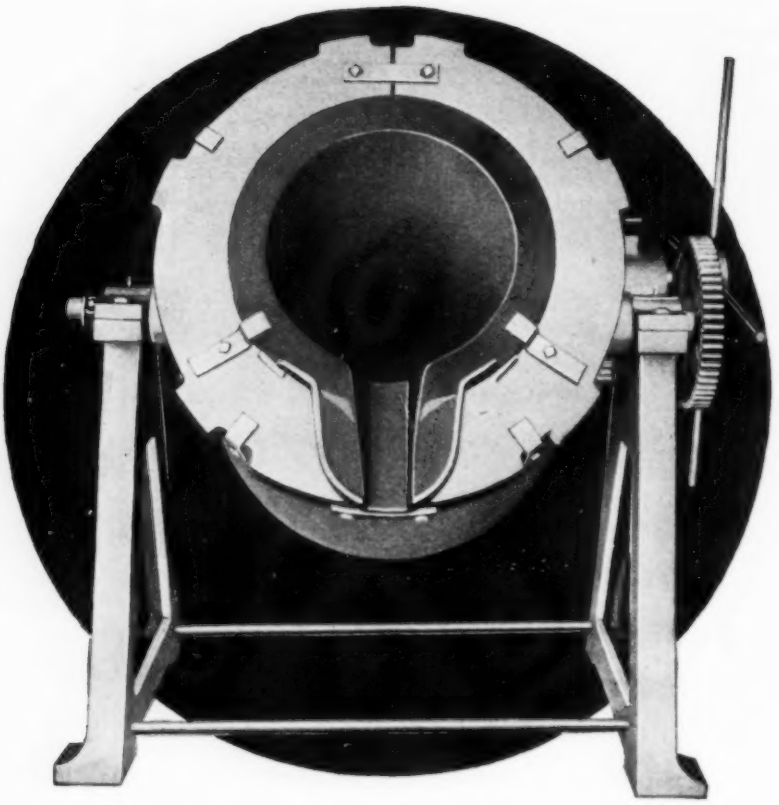
Insulated for the job, Swartwout Metal Insulated Ovens not only provide more rapid baking . . . but their heat conservation is also reflected in lower fuel bills.

THE SWARTWOUT COMPANY 18531 Euclid Avenue Cleveland, Ohio

Swartwout Metal Insulated Ovens

Heat cannot jump the Swartwout Stop-Gap Joint.

Free advice is worth listening to when it's authoritative. You'll find the recommendations of a Swartwout Engineer helpful in planning for your oven equipment.



Big batteries of these furnaces in daily use!

One company alone has over 350 in its various plants. An installation like this has real significance—it is the most conclusive proof of a profitable investment.

Our furnaces are rapid melters, and very economical in service.

We use a standard fire brick lining—no special brick is required. Maintenance cost is unusually low.

Built in 200 to 800 pound capacities; worm or spur gears.

The Aluminum Foundry Equipment Co.

318 Plymouth Bldg., Cleveland, Ohio

POTS for Aluminum, Lead and White Metal Melting

Alumet Pots Give Unusual Service

The iron in Alumet Pots is of special analysis to withstand the heat and effect of Aluminum melting. This iron is of very close grain, with absolutely no porous spots, and it does not scale readily.

If you will send us a pattern or blue print, we will supply you with the desired pot.

What Would YOU Do if this happened in YOUR foundry

YOU cut off the fins to make your castings look clean and trim, but how about the low spots—are you careful to fill surface defects, pits, etc.?

The one material that can be depended upon to fill depressions and become part of the casting, is

Smooth-On No. 4

Any man in your place can apply it perfectly and the whole quantity you need in a year is often paid for in the saving of one big casting alone.

Smooth-On No. 4 has been giving thorough satisfaction in this work for over 30 years. *No substitute will adapt itself to so many kinds of castings and service conditions and produce equally perfect match in color and texture.* As good results with Smooth-On No. 4 are always assured and the cost is insignificant, it certainly pays to use the best.

Foundries that turn out attractive looking work are the ones that get the highest prices for their product and the most orders in time of slow demand.

If you are not already familiar with the possibilities from Smooth-On No. 4, the free Smooth-On Handbook will tell you how to use it. Any fair trial will prove convincing. Our Service Engineers are further available for helpful suggestions.

Smooth-On No. 4 is made in two grades.

No. 4A for fine-grained castings

The very best iron cement known for foundry use. Finishes to match the surface of smooth high grade castings that must stand the closest inspection.

No. 4B For coarse-grained castings

For the general run of castings and far superior to any iron filling that can be obtained at equal cost.

Get Smooth-On No. 4 from any reliable dealer or supply house in 1-lb. and 5-lb. tins, and 25-lb., 50-lb. and 100-lb. kegs, or if necessary direct from us.

Mail coupon for FREE copy of Smooth-On Handbook

SMOOTH-ON MFG. CO., DEPT. 17,
570 Communipaw Ave., Jersey City, N. J.

Please send copy of the **Smooth-On** Handbook 20th Edition.

Name.....

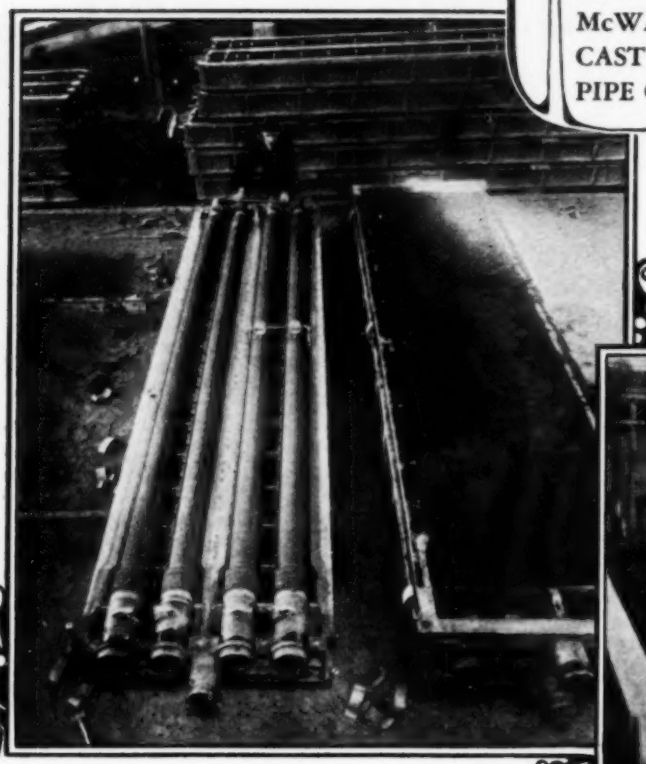
Address.....
12-28

Do it with

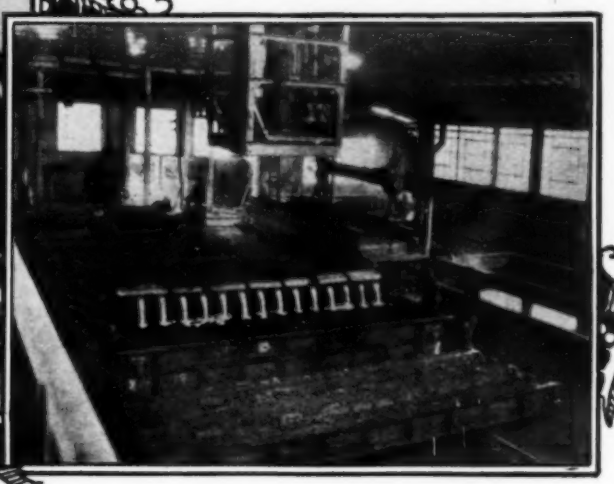
SMOOTH-ON

Prominent Users of PURITE

The McWANE CAST IRON PIPE CO.



Left: *Setting the cores at McWane Cast Iron Pipe Company, Birmingham, Alabama. Here four 8-inch pipes are cast horizontally in 16-foot lengths in green sand molds with green sand arbor cores, giving an unchilled casting, easily cut or tapped, which resists corrosion. Among other advantages, this system of molding reduces pipe-making from a three-day to a one-day operation.*



Below: *Pouring two pipes at once with fourteen separate streams of metal from large multi-lip ladle. This practice reduces to a minimum the distance of flow of the molten iron and gives a uniform quality of metal throughout the pipe section.*

In this foundry

PURITE Insures Uniform Iron Throughout the Heat

MUCH of the success of a continuous molding operation depends upon a steady supply of uniform metal at the pouring station. Nowhere is this more apparent than at the McWane Cast Iron Pipe Company, Birmingham, Alabama. Here you will see light-weight cast iron pipe in sixteen-foot lengths poured from multi-lip ladles—into green sand molds—at the rate of one pipe per minute throughout 16-hour heats.

This company was among the first to recognize the value of PURITE soon after it was offered to foundrymen in April, 1925. They received their first car in August of that year and have been purchasing regularly in carload quantities ever since. McWane will tell you that the use of PURITE is a factor in the outstanding success of their operations.

PURITE promotes more perfect combustion in the cupola by mixing with the limestone and producing a more fluid and active slag. It also increases the capacity of the slag for absorbing impurities from the metal. Continuous heats extending over 8 and 16-hour periods are being run at scores of foundries throughout the country every day with 2 or 3 pigs of PURITE per charge—and their last iron is as good as the first.

PURITE is equally valuable on short heats, for it melts ahead of the iron and fluxes out the ash accumulated on the bed coke during the soaking time. It starts the cupola off right and gives hot iron on the first tap.

PURITE *comes in two-pound pigs and is added so many per cupola charge. Nothing could be more simple and nowhere will so small an expenditure pay such large dividends.* PURITE *is available through foundry supply companies from stocks maintained in all the principal foundry centers.*

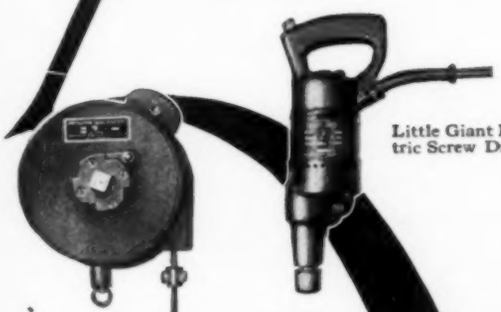
The MATHIESON ALKALI WORKS (Inc.)

250 PARK AVENUE NEW YORK CITY

PHILADELPHIA CHICAGO PROVIDENCE CHARLOTTE ST. LOUIS CINCINNATI

The Line of CP Equipment for Foundries

No. 33 Little Giant Grinder

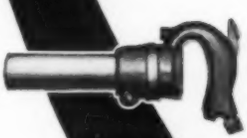


Little Giant Electric Screw Driver

Floor Rammer with Little Giant Automatic Oiler suspended from the Pedwyn Balancer

Chicago Universal Hose Coupling

CP-Cord Air Hose

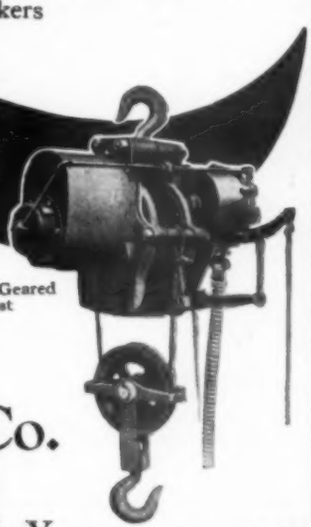


"AX" Oldham Chipping Hammer

Boyer Superior Chipping Hammer

No. 4B Keller Bench Rammer

Type "B" Oldham Floor Rammer



Little Giant Geared Air Hoist

Productive power is the sum of skill and adequate equipment. Without modern portable tools the foundry industry could never have developed to present imposing proportions.

Foundries that are not using the most modern equipment are the ones complaining about their inability to meet competition.

The following CP products are very generally recognized as representative of the latest development or refinement in portable foundry tools:

- Type "A" Boyer Superior and Type "BX" Oldham Floor Rammers
- Type "AX" Oldham and No. 4B Keller Bench Rammers
- Little Giant Electric Screw Drivers for Pattern Work
- No. 33 Little Giant Grinders
- Boyer Superior and Type "AX" Oldham Chipping Hammers
- Little Giant Pneumatic Hoists
- Pedwyn Balancers
- CP Cord Hose
- Chicago Universal Hose Couplings
- Little Giant Automatic Oilers
- Core Breakers

CHICAGO · CP · PNEUMATIC

Chicago Pneumatic Tool Co.

Sales and Service Branches all over the World

6 East 44th Street New York, N. Y.

J 286

TO MAKE good alloy steel requires good ferro-alloys. Electro Metallurgical Sales Corporation offers a complete line of ferro-alloys of high quality backed by more than 20 years of experience.

Our Service Department is maintained to demonstrate the proper use and benefits to be derived from these alloys.

. . .

CHROMIUM

High Carbon Ferrochrome (maximum 6% carbon)
Low Carbon Ferrochrome (in grades, maximum 0.10% to maximum 2.00% carbon)
Chromium Metal
Chromium-Copper
Miscellaneous Chromium Alloys

MANGANESE

Standard Ferromanganese 78 to 82%
Low Carbon Ferromanganese
Manganese Metal
Manganese-Silicon (Silico-Manganese)
Manganese-Copper
Miscellaneous Manganese Alloys

SILICON

Ferrosilicon 15%
Ferrosilicon 50%
Ferrosilicon 75%
Ferrosilicon 80 to 85%
Ferrosilicon 90 to 95%
Refined Silicon (minimum 97% silicon)
Calcium-Silicon
Silicon-Copper
Silico-Manganese (Manganese-Silicon)
Miscellaneous Silicon Alloys

VANADIUM

All Grades

ZIRCONIUM

Silicon-Zirconium
Zirconium-Ferrosilicon

Stabilizing the Bath with 15% Ferrosilicon

WAITING for the final chemical analysis is a critical point in steel manufacture. To stabilize your bath with Electric Furnace 15% Ferrosilicon while waiting for final chemical analysis is very desirable.

It is well to use ELECTROMET Brand Ferrosilicon because it is supplied in large pigs free from sand and graphite.

The use of this alloy makes it possible to control the final analysis more accurately.

ELECTROMET service means prompt shipment of your orders from stock and the help of our metallurgical staff when you need it.

Write for our booklet on the properties and uses of ELECTROMET alloys.

Electromet Brand *Ferro-Alloys and Metals*

Sole Distributors

ELECTRO METALLURGICAL SALES CORPORATION

Unit of Union Carbide and Carbon Corporation

Carbide and Carbon Building, 30 E. 42d St., New York

"They stay on the job," says Joe Zozula

"THEY handle easier, have less time down, and sure do turn out the work," comments Joe.

And John Hendrickson, superintendent at the Bryant Heater Company plant adds that "maintenance costs are almost nothing!"

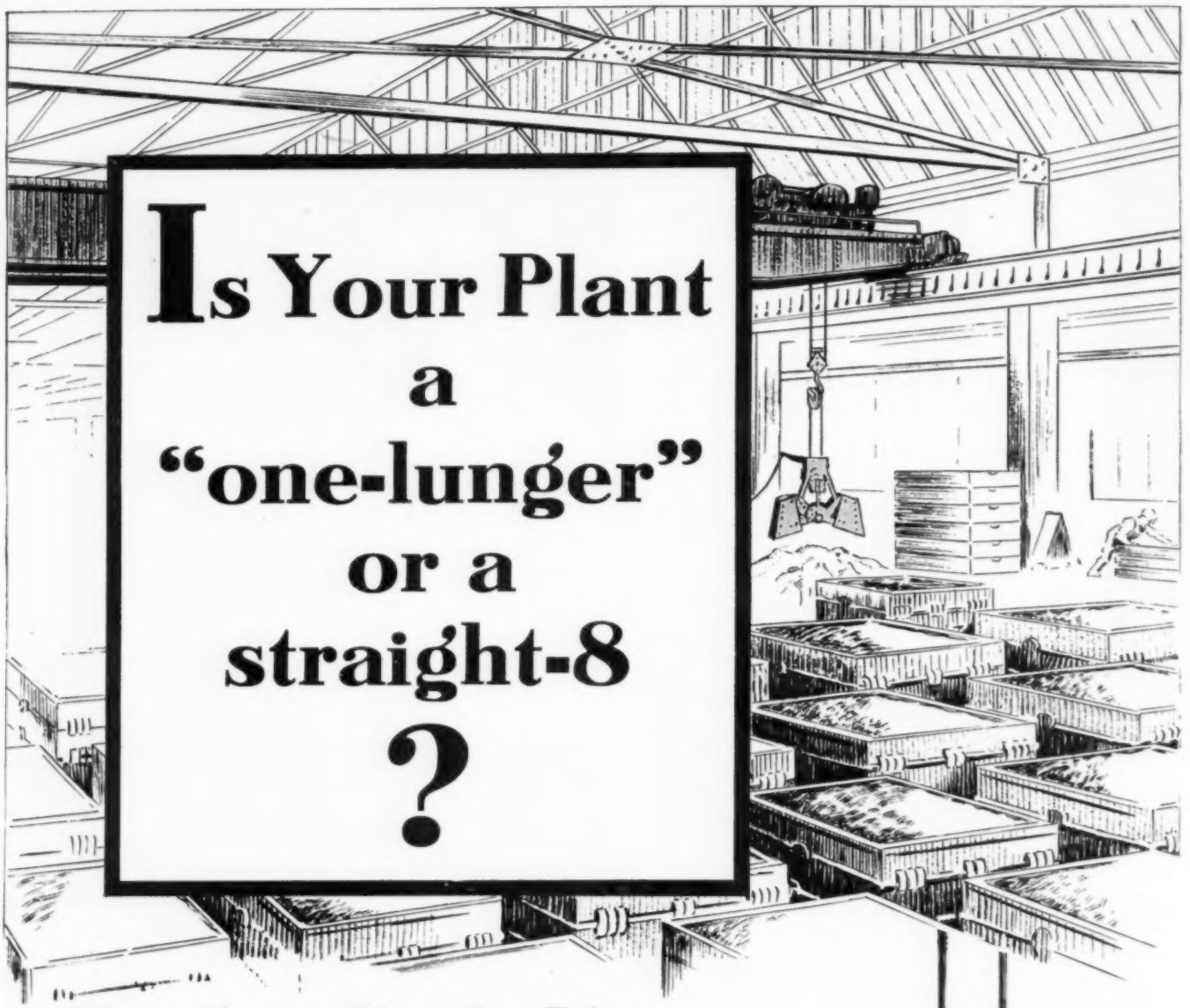
The D-3 Rotor Grinder that Joe uses on these heavy heater castings weighs only 16 pounds, and is built for steady production on heavy duty work.

Vibrationless... light... powerful Rotor Grinders can speed up production and reduce maintenance costs in your plant. Ask to try one of them.

The Rotor Air Tool Company
5905 Carnegie Avenue
Cleveland, Ohio

GRINDERS • BUFFERS • SANDERS • DRILLS

Rotor Air Tools



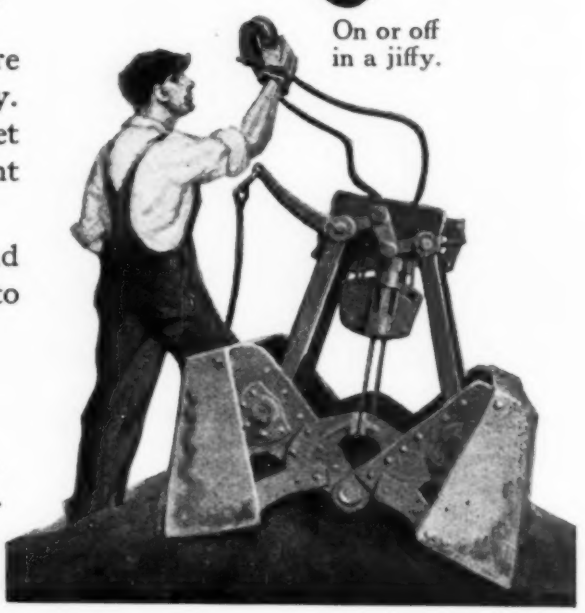
Is Your Plant a "one-lunger" or a straight-8 ?

Give it a Single Line Grab Bucket

for modern standards of operation

An old one cylinder automobile will get you there and back but it's neither efficient or very satisfactory. The foundry trying to operate without a grab bucket is handicapping itself against the cost-cutting, efficient equipment of a lot of "straight-8" competitors.

What a P&H Single Line Grab Bucket will do, and what users think of it, makes interesting reading to foundry executives. Just write for Bulletin 101.



On or off in a jiffy.

HARNISCHFEGER CORPORATION

P&H

Established in 1884
3805 National Ave.
Milwaukee, Wis.

Offices and Agents in All Principal Cities

NOVIWELD LENSES
for welder's helmets and goggles

CALOBAR LENSES
for forge and furnace workers' goggles

1929 specifications for complete protection from injurious light . .

NOVIWELD glass has been further develcped. No other welding glass gives the sure protection and the comfort of the new Noviweld (NW). It is a complete safeguard against the sensation of "hot sand in the eyes", red eyelids and other annoyances common to welders. It protects welders' eyes against 99.9% of injurious rays. We want you to see the spectrum transmission chart that shows graphically the absorption value of New Noviweld.

CALOBAR glass protects the eyes from injurious rays encountered by men working at forges and furnaces, where high temperature produces excessive quantities of heat and light. The high visibility of Calobar glass shows all colors in their true value. It has a soft, restful shade, and gives you a high percentage of helpful light. Men working at forges and furnaces need exactly this protection together with high visibility.

These lenses should be your standard equipment for 1929

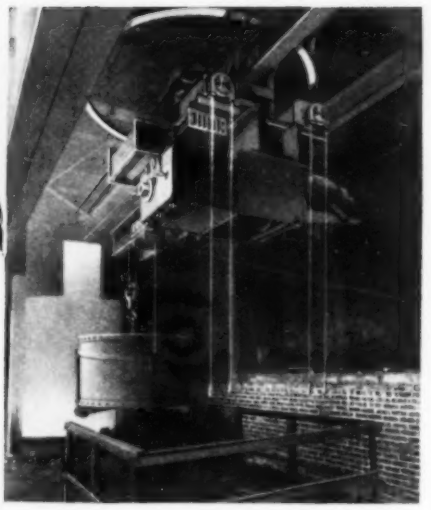
American Optical *Company*

Safety Division

NEW YORK ST. LOUIS SAN FRANCISCO CHICAGO KANSAS CITY ATLANTA

Pay Roll Reduction Plus Faster Production

EUCLID CRANES

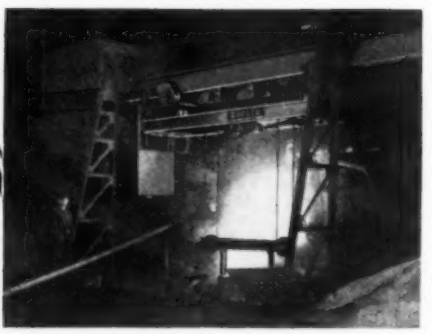


An Electric Monorail Hoist with lifting magnet to handle scrap.

An Electric Charger to charge your cupola.

A Ladle Trolley to carry molten metal from electric furnace to molders.

An Overhead Traveling Crane to serve the molding floor.



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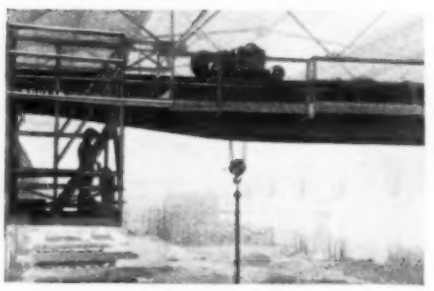

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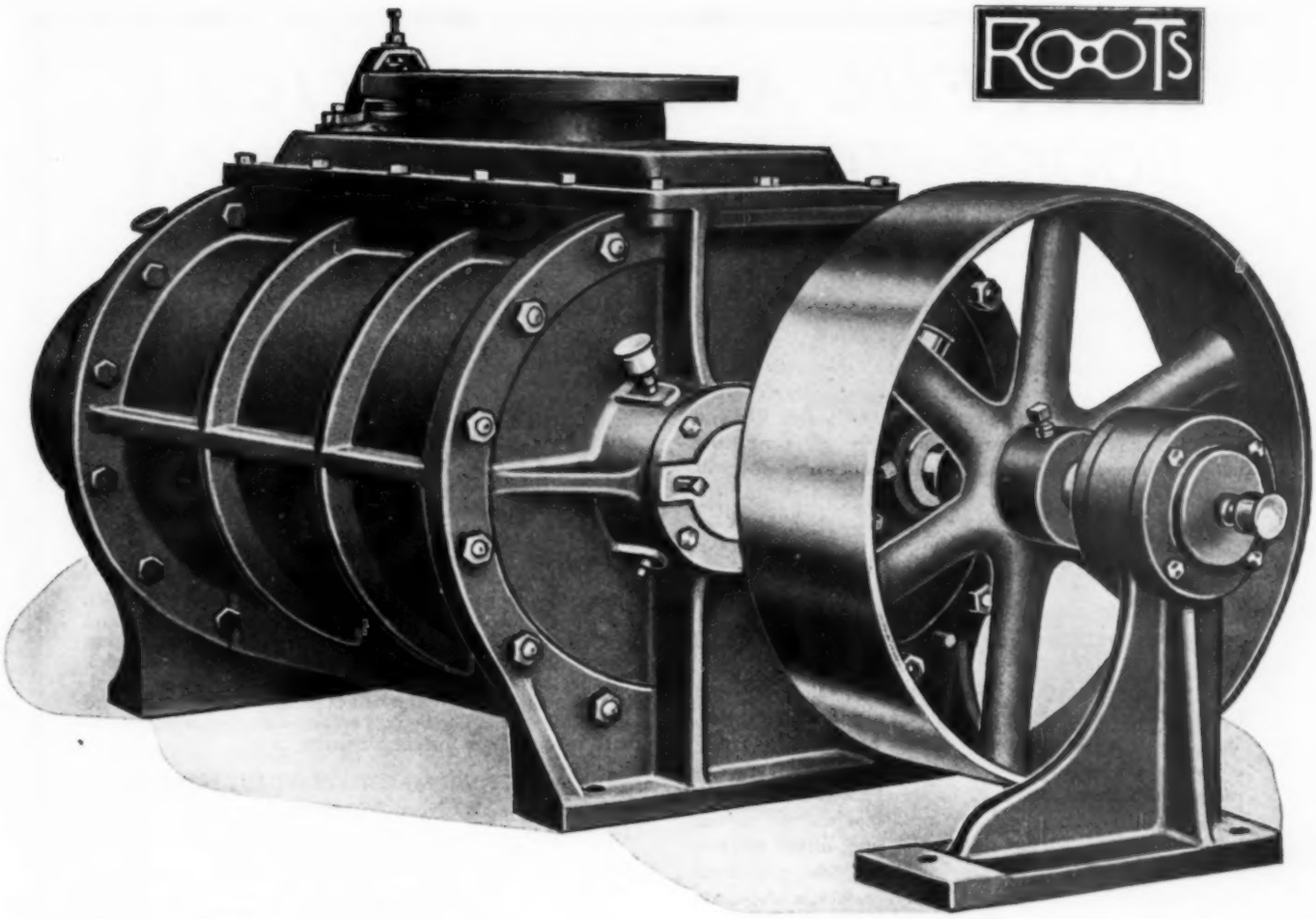

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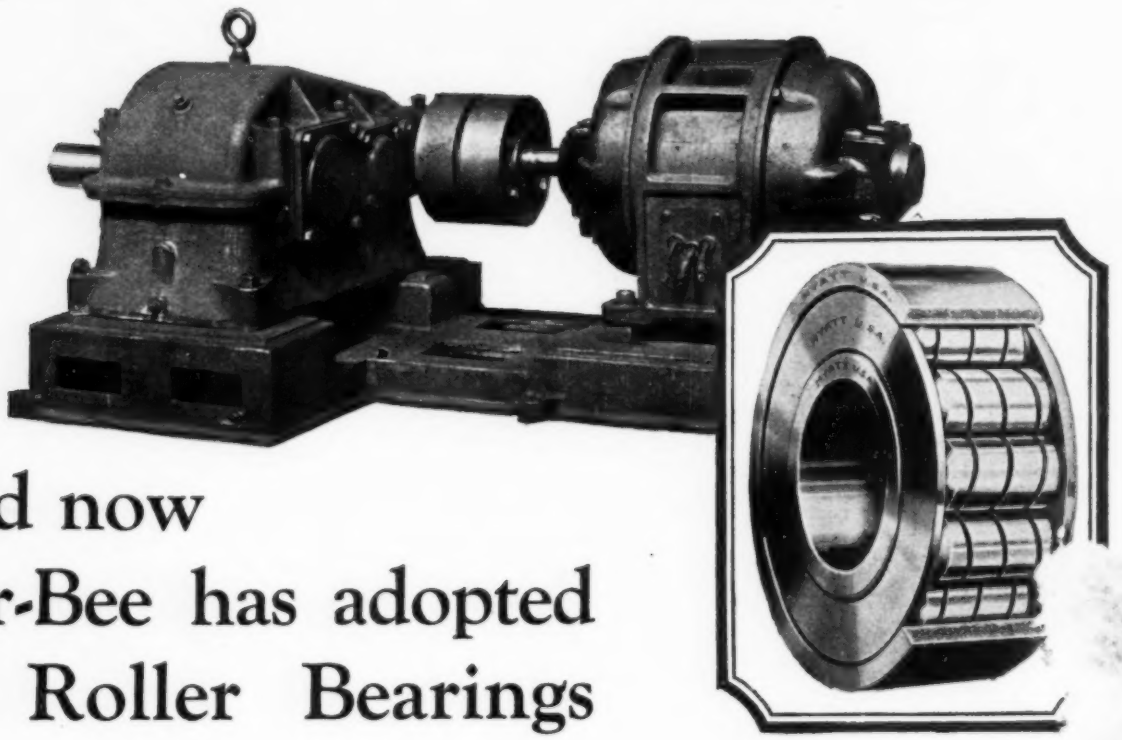

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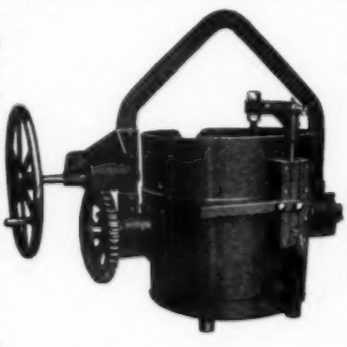

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Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 S. Michigan Ave., Chicago.

CORE COMPOUND

Corn Products Refining Co., 17 Battery Place, New York City.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.
Kellogg, Spencer, & Sons, Inc., Buffalo, N. Y.
Pennsylvania Lubricating Co., 34th & Smallman Sts., Pittsburgh, Pa.
Smith, Werner G., Co., 2191 W. 110th St., Cleveland, O.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

CORE FLOUR

Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

CORE MAKING Machines

American Foundry Equipment Co., Mishawaka, Ind.
Arcade Mfg. Co., Dept. D. Freeport, Ill.
Demmler, Wm., & Brothers, Kewanee, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh.
International Molding Machine Co., 2616 W. 16th St., Chicago, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Tabor Manufacturing Co., 6225 Tacony St., Philadelphia.

CORE OIL

Kellogg, Spencer, & Sons, Inc., Buffalo, N. Y.
Pennsylvania Lubricating Co., 34th & Smallman Sts., Pittsburgh, Pa.
Robinson, Wm. C., & Son Co., Caroline & Dock Sts., Baltimore, Md.
Smith, Werner G., Co., 2191 W. 110th St., Cleveland, O.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

CORE OVENS

Foundry Equipment Co., The, 1831 Columbus Rd., Cleveland, O.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.
Swartwout Co., The, 18531 Euclid Ave., Cleveland, O.
Whiting Corp., Harvey, Ill.
Young Brothers Co., 6508 Mack Ave., Detroit, Mich.

CORE PLATES—Steel

The Shanafelt Manufacturing Co., 1228 Fourth St., S. W., Canton, O.

CORE RACKS

Foundry Equipment Co., The, 1831 Columbus Rd., Cleveland.
Whiting Corp., Harvey, Ill.

CORE REDUCERS

National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.

CORE RODS

Franklin Core Rod & Gagger Co., Franklin, Pa.

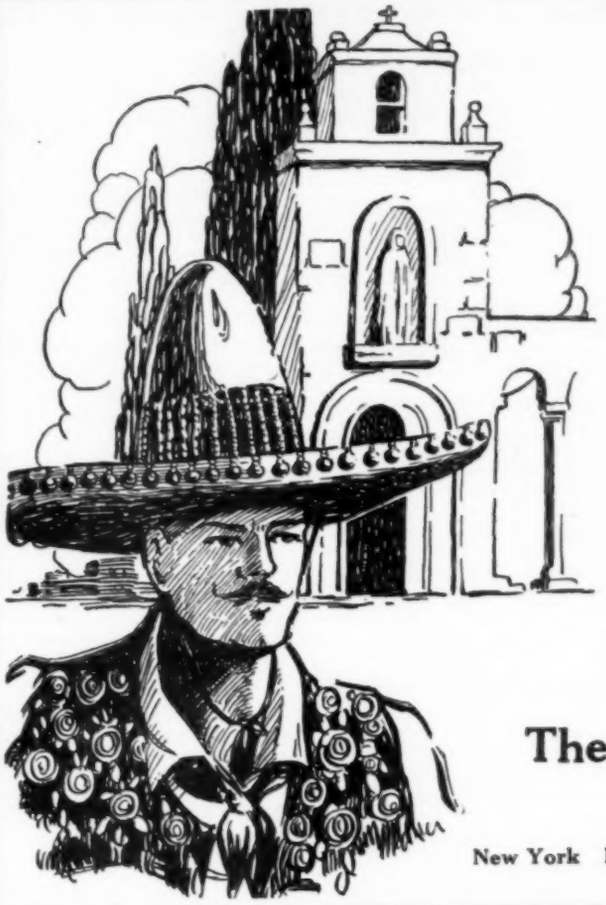
CORE ROD STRAIGHTENing and Cutting Machines

American Foundry Equipment Co., Mishawaka, Ind.

CORE SAND MIXERS

National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above



MEXICAN PLUMBAGO

There is *real economy* in the use of U.S.G. Mexican Plumbago because castings come cleaner—and much time and labor is saved in the cleaning room.

Try it—and see for yourself. We'll gladly send you a quantity for testing purposes—gratis. Write us now.

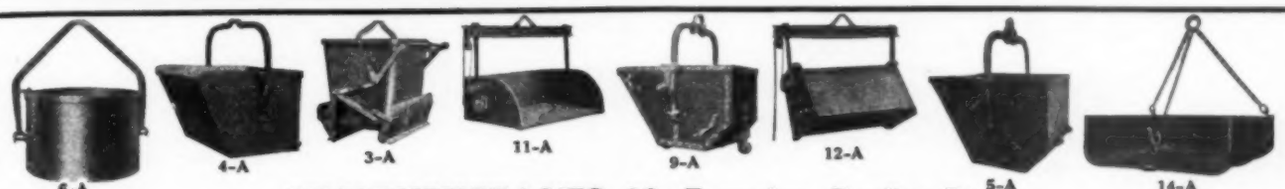
The United States Graphite Co.
Saginaw, Michigan

New York Philadelphia Pittsburgh Chicago St. Louis San Francisco

•7

All Bucket! "Built to Dig, and Last While Digging."
G. H. Williams Co., 612 Haybarger Lane, Erie, Pa. Branch Offices: New York, Pittsburgh, Cleveland, Chicago
WILLIAMS
FAST-DIGGING BUCKETS

Reading Chain & Block Corporation
Reading, Pa.
Chain Blocks, Trolleys, Chains, Electric Hoists, Traveling Cranes, Tramways
We Solicit Your Inquiries



Dumping Buckets

PENN FOUNDRY & MFG. CO., Evans Ave., Reading, Pa.

Cars and Trucks

A New Development in Foundry Stars

Faster, Better Cleaning

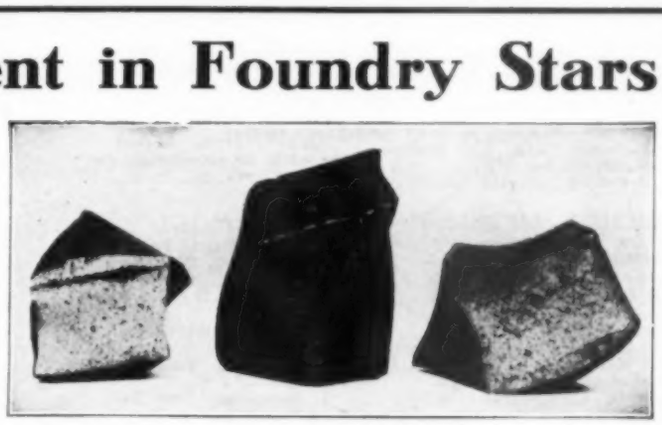
Tempered Twisted Foundry Stars of high carbon steel. Eight pointed—twelve cleaning edges—shear blade hardness throughout—unequalled cleaning surface—perfect tumbling—long life. Sizes ¾", 1", 1½", 2" and 2½".

Uniform shear blade hardness throughout!

We also manufacture Franklin Twisted Steel Gaggers and Core Rods.

Order direct or through your jobber.

Franklin Core Rod & Gagger Co.
Franklin, Pa.



Patent No. 1682246.

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CORE WASH
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.
United States Graphite Co., Saginaw, Mich.

COUPLINGS—Flexible
Roots, P. H., and F. M., Co., Connersville, Ind.

CRANES
Euclid Crane & Hoist Co., The, Euclid, Ohio.

CRANES—Bucket
Cleveland Crane & Engineering Co., Wickliffe, O.
Euclid Crane & Hoist Co., The, Euclid, Ohio.
Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.
Whiting Corp., Harvey, Ill.

CRANES—Crawler and Locomotive Type
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CRANES—Electric Traveling
Box Crane & Hoist Corp., 2226 Ontario St., Philadelphia, Pa.
Chisholm-Moore Hoist Corp., (Division of Columbus-McKinnon Chain Co.), Fremont Ave., Tonawanda, N. Y.
Cleveland Crane & Engineering Co., Wickliffe, O.
Euclid Crane & Hoist Co., The, Euclid, Ohio
Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.
Scully-Jones & Co., 2012 W. 13th St., Chicago, Ill.
Whiting Corp., Harvey, Ill.

CRANES—Gantry
Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Hand Traveling
Box Crane & Hoist Corp., 2226 Ontario St., Philadelphia, Pa.
Chisholm-Moore Hoist Corp., (Division of Columbus-McKinnon Chain Co.), Fremont Ave., Tonawanda, N. Y.
Cleveland Electric Tramrail Division of Cleveland Crane & Engineering Co., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1573 Kienlen Ave., St. Louis, Mo.
Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.
Scully-Jones & Co., 2012 W. 13th St., Chicago, Ill.
Whiting Corp., Harvey, Ill.

CRANES—Jib
Cleveland Electric Tramrail Division of Cleveland Crane & Engineering Co., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1573 Kienlen Ave., St. Louis, Mo.
Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.
Scully-Jones & Co., 2012 W. 13th St., Chicago, Ill.
Whiting Corp., Harvey, Ill.

CRANES—MONORAIL
Euclid Crane & Hoist Co., The, Euclid, Ohio.

CRANES—Overhead
Euclid Crane & Hoist Co., The, Euclid, Ohio.

CRANES—Wall
Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.
Whiting Corp., Harvey, Ill.

CRUCIBLE LIFTERS
Foundry Equipment Co., 1831 Columbus Rd., Cleveland, O.

CRUCIBLES
Dixon, Jos., Crucible Co., Jersey City, N. J.
Lava Crucible Co., of Pittsburgh, 309 Wabash Bldg., Pittsburgh, Pa.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.

CRUSHED STEEL—See Steel—Crushed

CUPOLA BLOCKS
Queen's Run Refractories Co., Lock Haven, Pa.
U. S. Refractories Corp., Mt. Union, Pa.

CUPOLA BLOWERS
Spencer Turbine Co., Hartford, Conn.

CUPOLA BRICK
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.
Whiting Corp., Harvey, Ill.

CUPOLA CHARGING Machines—Electric
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Chisholm-Moore Hoist Corp., (Division of Columbus-McKinnon Chain Co.), Fremont Ave., Tonawanda, N. Y.
Euclid Crane & Hoist Co., The, Euclid, Ohio.
Whiting Corp., Harvey, Ill.

CUPOLA DAUB
Illinois Clay Products Co., Joliet, Ill.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

CUPOLA LIGHTERS
Hauck Mfg. Co., 126 Tenth St., Brooklyn, N. Y.

CUPOLAS
Sly, W. W., Mfg. Co., The, 4702 Train Ave., Cleveland, O.
Whiting Corp., Harvey, Ill.

CUTTING AND WELDING—Oxy-Acetylene—See Welding and Cutting Apparatus and Supplies—Oxy-Acetylene

CYLINDERS—Acetylene—See Acetylene in Cylinders

CYLINDERS—Oxygen—See Oxygen in Cylinders

DECARBONIZING Apparatus
Oxweld Acetylene Co., Newark, N. J.

DEOXIDIZERS
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

DESULPHURIZER
Mathieson Alkali Works, Inc., 250 Park Ave., New York City

DIE CASTING EQUIP.—Goose Necks and Pots
Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.

DOWEL PINS—Brass
Diamond Clamp & Flask Co., Richmond, Ind.

DOWEL PINS—Brass, Iron, Wood
Shanafelt Manufacturing Co., 1228 Fourth St., S. W., Canton, O.

DRILLS—Electric
Chicago Pneumatic Tool Co., 6 E. 44th St., New York City
Stow Mfg. Co., Binghamton, N. Y.

DRILLS—Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRYERS—Sand—See Sand Dryers

DUST ARRESTING and Collecting Systems
American Foundry Equipment Co., Mishawaka, Ind.
Knickerbocker Co., The, Jackson, Mich.
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.
Whiting Corp., Harvey, Ill.

ELEVATORS and Conveyors
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Whiting Corp., Harvey, Ill.

ELEVATORS—Straight Lift
Standard Conveyor Co., 315 Second Ave., North St. Paul, Minn.

ENGINEERS—Foundry, Mechanical, Electrical, etc.
Austin Co., The, 16112 Euclid Ave., Cleveland, O.
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Beardsley & Piper Co., 2541 No. Keeler Ave., Chicago, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.

ENGINEERS—Architects—Contractors
Austin Co., The, 16112 Euclid Ave., Cleveland, O.

ENGINES—Oil, Gas
Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.
Ingersoll-Rand Co., 11 Broadway, New York City.

EXHAUST SYSTEMS
American Foundry Equipment Co., Mishawaka, Ind.
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.
Whiting Corp., Harvey, Ill.

EXHAUSTERS—Gas
Roots, P. H. and F. M., Co., Connersville, Ind.

EYE PROTECTORS—See Goggles and Eye Protectors

FACING SAND MIXERS
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.

FACINGS
Dixon, Jos., Crucible Co., Jersey City, N. J.
Knefler-Bates Manufacturing Co., Indianapolis, Ind.
Pennsylvania Foundry Supply Co., Liberty Bldg., Philadelphia, Pa.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.
United States Graphite Co., Saginaw, Mich.

FERROALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Williams & Co., Inc., 901-37 Pennsylvania Ave., Pittsburgh, Pa.

FERROCARBON-Titanium
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Foundry Manganese Co., 208 Harrison Bldg., Philadelphia, Pa.

FERROSILICON
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Foundry Manganese Co., 208 Harrison Bldg., Philadelphia, Pa.

FILLERS—METALLIC
Smooth-on Mfg. Co., 572 Communipaw Ave., Jersey City, N. J.

FILLET—Leather, Wood
Shanafelt Manufacturing Co., 1228 Fourth St., S. W., Canton, O.

FIRE BRICK AND CLAY
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

FIRE CLAY
Illinois Clay Products Co., Barber Bldg., Joliet, Ill.

FLASK FITTINGS
Adams Co., 175 Foster St., Dubuque, Ia.
Diamond Clamp & Flask Co., Richmond, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.

FLASKS
Adams Co., The, 175 Foster St., Dubuque, Iowa.
American Foundry Equipment Co., Mishawaka, Ind.
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Shanafelt Manufacturing Co., 1228 Fourth St., S. W., Canton, O.
Tabor Manufacturing Co., 6225 Tacony St., Philadelphia, Pa.

FLOUR—Foundry
Illinois Clay Products Co., Joliet, Ill.
Knefler-Bates Manufacturing Co., Indianapolis, Ind.

FLUX—Aluminum
Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.

FLUX—Aluminum, Brass, Copper, Iron, Steel
Mathieson Alkali Works, Inc. 250 Park Ave., New York City.
Oxweld Acetylene Co., Newark, N. J.

FLUX—Welding
Oxweld Acetylene Co., Newark, N. J.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above

Bin Gates That Work

IT doesn't take many instances where a jammed bin gate has failed to stop the flow of material to point out the necessity of installing "bin gates that work".

That's one reason why so many plants needing bin gates get them from Robins.

With many different styles—cut-off radial, sliding, rack and pinion—Robins can supply you with the style best suited to your needs. For further details write to our nearest office.

ROBINS CONVEYING BELT COMPANY

New York Chicago

Boston Philadelphia Pittsburgh Los Angeles

Agents in other principal cities

Robins Conveying Belt Company, Magnet House, London
Robins Conveyors, (S.A.) Ltd., Johannesburg

MODERN Pouring and Mold Handling Cranes
are GUARANTEED for Easy Operation
Write us for details.
MODERN POURING DEVICE CO
METAL POURING MACHY
PORT WASHINGTON, WIS.

Imperial

OXY-ACETYLENE
Welding and Cutting Equipment
An Outfit for Every Shop and Every Purpose
The Imperial Brass Mfg. Co. 1203 W. Harrison St. Chicago

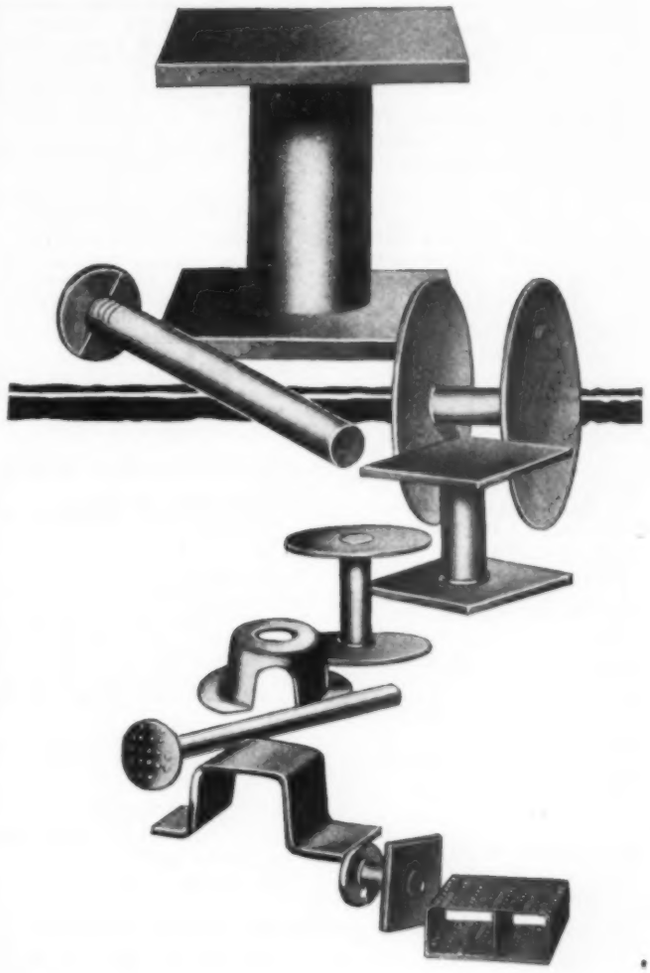
Set these packs of Lenox Wolves on the trail of your toughest jobs!

Thousands of shops the country over—shops whose work demands of hack saw blades the very finest quality that money can buy—have turned to these packs of rangy, rugged, super-strong Wolves of Lenox.

If you are looking for long-lasting, keen edges—for blades that cost less because they cut more, just ask for "The Tools in the Plaid Box"

AMERICAN SAW & MFG. CO.
Springfield, Mass.

A product by the makers of the famous wolves of Lenox-hack saw blades. Send for a copy of "The story of the Wolves of Lenox."



SHANAFELT

SPECIAL BASIC METAL

CHAPLETS

To fully serve its purpose, a chaplet must not only support the core but must thoroughly fuse with the molten metal so as to become an integral part of the casting. Shanafelt Chaplets are designed and made to meet these requirements.

THE SHANAFELT MANUFACTURING CO.
Established 1893
Canton, Ohio, U. S. A.

AB 34 D S

Mark your patterns with Shanafelt Letters & Figures and identify your castings with Monograms.

FORGINGS—Pressed & Drop

Bethlehem Steel Co., Bethlehem, Pa.

FOUNDRY AND FACTORY Buildings—See Buildings—Foundry, Factory, Industrial

FOUNDRY ENGINEERS—See Engineers—Foundry, Mechanical, Electrical, etc.

FOUNDRY EQUIPMENT—Second Hand

Clifton-Pratt Co., The, Cincinnati, O.

Scully-Jones & Co., 2012 W. 13th St., Chicago, Ill

FOUNDRY SPECIALISTS—See Engineers—Foundry, Mechanical, Electric, Etc.

FOUNDRY SUPPLY Houses

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.

Pennsylvania Foundry Supply Co., Liberty Bldg., Philadelphia, Pa.

Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

FURNACE LININGS—Clay

Illinois Clay Products Co., Joliet, Ill.

FURNACE LININGS—Graphite

Dixon, Jos., Crucible Co., Jersey City, N. J.

FURNACES—Crucible

Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.

FURNACES—Crucible Steel

Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.

Foundry Equipment Co., 1831 Columbus Rd., Cleveland, O.

FURNACES—Electric-Brass and Aluminum

Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.

Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit, Mich.

Pittsburgh Electric Furnace Corp., 32nd St. & Putney Way, Pittsburg, Pa.

FURNACES—Electric for Annealing, Hardening, Drawing, Carbonizing

Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.

Swindell, Wm., & Bros., P. O. Box 1753, Pittsburgh, Pa.

FURNACES—Electric Melting

American Bridge Co., 71 Broadway, New York City.

Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit, Mich.

Foundry Equipment Co., 1831 Columbus Rd., Cleveland, O.

Pittsburgh Electric Furnace Corp., 32nd St. & Putney Way, Pittsburgh, Pa.

Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

Swindell, Wm., & Bros., P. O. Box 1753, Pittsburgh, Pa.

FURNACES—Melting—Aluminum and Brass

Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.

Foundry Equipment Co., 1831 Columbus Rd., Cleveland, O.

Pittsburgh Electric Furnace Corp., 32nd St. & Putney Way, Pittsburgh, Pa.

Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

FURNACES—Open Hearth

Swindell, Wm., & Bros., P. O. Box 1753, Pittsburgh, Pa.

GAGGERS

Bourne-Fuller Co., 1912 Scranton Rd., Cleveland, O.

Franklin Core Rod & Gagger Co., Franklin, Pa.

The Shanafelt Manufacturing Co., 1228 Fourth St., S. W., Canton, O.

United Compound Co., 228 Elk St., Buffalo, N. Y.

GAS BOOSTERS—Rotary Positive Pressure

Roots, P. H. and F. M., Co., Connersville, Ind.

GAS—Oxygen, Nitrogen

Prest-O-Lite Co., Inc., 30 E. 42nd St., New York City.

GAS EXHAUSTERS—See Exhausters—Gas

GAS EXHAUSTERS—Rotary Positive Pressure

Roots, P. H. and F. M., Co., Connersville, Ind.

GAUGES—Welding

Oxweld Acetylene Co., Newark, N. J.

GLASSES—Gauge

Jenkins Brothers 80 White St., New York City

GLOVES—Asbestos

Oxweld Acetylene Co., Newark, N. J.

GLOVES—Sandblast

American Foundry Equipment Co., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

GOGGLES AND EYE Protectors

American Optical Co., Southbridge, Mass.

Oxweld Acetylene Co., Newark, N. J.

GRAPHITE

United States Graphite Co., The Saginaw, Mich.

GRAPHITE—Boiler and Lubricating

Dixon, Jos., Crucible Co., Jersey City, N. J.

United States Graphite Co., Saginaw, Mich.

GRINDERS—Electric Portable

Black & Decker Mfg. Co., Towson, Md.

Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.

Stow Mfg. Co., Binghamton, N. Y.

Strand, N. A., & Co., 5001-5009 North Lincoln St., Chicago, Ill.

GRINDERS—Pneumatic Portable

Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.

Cleveland Pneumatic Tool Co., 3734 E. 78th St., Cleveland, O.

Ingersoll Rand Co., 11 Broadway, New York City.

Rotor Air Tool Co., 5900 Carnegie Ave., Cleveland, O.

Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill.

GRINDING MACHINES—Snagging, Motor Driven

Black & Decker Mfg. Co., Towson, Md.

Standard Electrical Tool Co., Cincinnati, Ohio.

GRINDING PANS—Sand

Phillips & McLaren Co., 24th and Smallman Sts., Pittsburgh, Pa.

GRINDING WHEEL Stands

Black & Decker Mfg. Co., Towson, Md.

GRINDING WHEELS—See Abrasive Wheels

GRIT—Angular and Steel

American Steel Abrasives Co., Galion, O.

Pangborn Corp., Hagerstown, Md.

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.

HACK SAWS—See Saws—Hack

HAMMERS—Chipping and Riveting—Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.

Cleveland Pneumatic Tool Co., 3734 E. 78th St., Cleveland, O.

Ingersoll-Rand Co., 11 Broadway, New York City.

HANGERS—Roller Bearing for Line Shafts

Hyatt Roller Bearing Co., Harrison, N. J.

HARDNESS TESTING & Heat Measuring Instruments

Shore Instrument & Mfg. Co., Inc., Van Wyck Ave. & Carll St., Jamaica, L. I., New York.

HELMETS—Sandblast

Pangborn Corp., Hagerstown, Md.

Pulmosan Safety Equipment Corp., 172 Johnson St., Brooklyn, N. Y.

HINGE TUBES

The Shanafelt Manufacturing Co., 1228 Fourth St., S. W., Canton, O.

HOISTING MACHINERY

Cleveland Crane & Engineering Co., Wickliffe, O.

Euclid Crane & Hoist Co., The, Euclid, Ohio.

Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.

HOISTS—Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.

Curtis Pneumatic Machinery Co., 1573 Kienlen Ave., St. Louis, Mo.

Hanna Engineering Works, 1761 Elston Ave., Chicago, Ill.

Ingersoll-Rand Co., 11 Broadway, New York City

Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill.

HOISTS—Chain

Chisholm-Moore Hoist Corp., (Division of Columbus-McKinnon Chain Co.), Lakeside and E. 49th St., Cleveland, O.

Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.

Reading Chai.. & Block Corp., Reading, Pa.

HOISTS—Electric

Box Crane & Hoist Corp., 2226 Ontario St., Philadelphia, Pa.

Chisholm-Moore Hoist Corp., (Division of Columbus-McKinnon Chain Co.), Fremont Ave., Tonawanda, N. Y.

Cleveland Electric Tramrail Division of Cleveland Crane & Engineering Co., Wickliffe, O.

Euclid Crane & Hoist Co., The, Euclid, Ohio.

Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.

HOISTS—Monorail

Cleveland Electric Tramrail Division of Cleveland Crane & Engineering Co., Wickliffe, O.

Euclid Crane & Hoist Co., The, Euclid, Ohio.

HOISTS—Pneumatic

Whiting Corp., Harvey, Ill.

HOLDERS-ON

Chicago Pneumatic Tool Co., 6 E. 44th St., New York City

HOODS—Leather Sandblast

Pangborn Corp., Hagerstown, Md.

HOSE—Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.

HOSE—Sandblast

American Foundry Equipment Co., Mishawaka, Ind.

Pangborn Corp., Hagerstown, Md.

HOSE—Welding

Oxweld Acetylene Co., Newark, N. J.

HOSE COUPLINGS—Pneumatic

Cleveland Pneumatic Tool Co., 3734 E. 78th St., S. E., Cleveland.

HOSE COUPLINGS—Universal

Chicago Pneumatic Tool Co., 6 E. 44th St., New York City

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above

A Chicago Foundry Has Used 7166 lbs.
of
MENCO Pattern Compound

MENCO is used by adding it to water to form a smooth, thin cream, and then poured into the mold.

Since June 26, 1921 and has this to say:

"We are sold on Menco for our foundry and have recommended it to others as a desirable material for making matches."

YOU can not afford to be without MENCO.

During this month we will accept your order for 100 pounds of MENCO at 12 cents per lb. FOB Fort Wayne, Ind.

The Menefee Foundry Company, Inc.
Sole Manufacturers
Fort Wayne, Indiana

"Your Clean Castings Make Customers Lasting"

"Servrite" Whiteiron Tumbling Stars

The Ervin Foundry & Manufacturing Co.
1018 E. Michigan Street, Adrian, Michigan

Chaplets for every purpose
Write for descriptive bulletin
Pennsylvania Foundry Supply Co.
Liberty Bldg. — Philadelphia
New Jersey Branch, 375 Clifton Ave., Newark, N. J.
New England Branch, 423 E. Eighth St., So. Boston, Mass.

U. S. ALUMINUM MATCH PLATE CO.

1269 West 76th St. — Cleveland, Ohio

Specializing in

CAST ALUMINUM MATCH PLATES
BRASS AND ALUMINUM PATTERN CASTINGS

Exclusively

HEAVY TYPE

LIGHT TYPE

5 POINT

WHITE IRON STARS

MAXIMUM RESULTS AT MINIMUM COST

COMPLETE STOCKS

1030 W. 38th St., Chicago, Ill.

THE JOHNSTON & JENNINGS CO.
CLEVELAND, OHIO

PROMPT SHIPMENT

104 N. Solvay St., DETROIT, MICH.

IDLERS—Conveyors and Elevators
Robins Conveying Belt Co., 15 Park Row, New York City

INGOTS—Aluminum
British Aluminium Co., 165 Broadway, New York City.

INGOTS—Brass, Bronze, Copper, Nickel
Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.

JACKETS—Snap Flask Mold
Adams Co., 175 Foster St., Dubuque, Iowa.
American Foundry Equipment Co., Mishawaka, Ind.
Diamond Clamp & Flask Co., Richmond, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.

JACKETS—Steel
Adams Co., The, 175 Foster St., Dubuque, Iowa.
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
The Shanafelt Manufacturing Co., 1228 Fourth St., S. W., Canton, O.

JOLT RAMMING Machines
International Molding Machine Co., 2616 W. 16th St., Chicago, Ill.

JOLT RAMMING Machines—Pneumatic and Electric
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh, Pa.
Johnston & Jennings Co., 877 Addison Rd., Cleveland.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Tabor Manufacturing Co., 6225 Tacony St., Philadephia, Pa.

LADLE HEATERS AND Dryers
Hauck Mfg. Co., 126 Tenth St., Brooklyn, N. Y.

LADLE LININGS
Illinois Clay Products Co., Joliet, Ill.

LADLES
Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.
Industrial Equipment Co., Minster, O.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.
Whiting Corp., Harvey, Ill.

LADLES—Truck
Whiting Corp., Harvey, Ill.

LEAD
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.
United States Graphite Co., The, Saginaw, Mich.

LINE SHAFT BEARINGS—Roller
Hyatt Roller Bearing Co., Harrison, N. J.

LININGS—Monolithic
Alpha-Lux Co., 192 Front St., New York City.

LINSEED OIL—Core
Kellog, Spencer, & Sons, Inc., Buffalo, N. Y.
Smith, Werner G., Co., 2191 W. 110th St., Cleveland, O.

LOADERS—Portable, Belt or Bucket
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

MACHINERY—Special
Bethlehem Steel Co., Bethlehem, Pa.
Whiting Corp., Harvey, Ill.

MAGNETS—Electro, Safety
Magnetic Mfg. Co., 241 24th Ave., Milwaukee, Wis.

MANIFOLDS—Oxygen
Oxweld Acetylene Co., Newark, N. J.

MATCH PLATES—Aluminum
U. S. Aluminum Match Plate Co., 1269 W. 76th St., Cleveland, O.

MELTING POTS
Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.

METALS—Nonferrous
Ajax Metal Co., 46 Richmond St., Philadelphia, Pa.
Titanium Alloy Mfg. Co., The, Niagara Falls, N. Y.

METERS—Gas and Air
Roots, P. H. & F. M., Co., Connersville, Ind.

MILLING STARS AND Jacks—See Stars—Tumbling Mill

MILLS—Sand Mixing and Compounding
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.

MIXERS—Sand—See Sand Mixers and Cutters

MOLD CONVEYORS
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Link Belt Co., 910 S. Michigan Ave., Chicago, Ill.

MOLD DRYERS
Young Brothers Co., 6508 Mack Ave., Detroit, Mich.

MOLD OVENS
Foundry Equipment Co., 1831 Columbus Rd., Cleveland, O.
Holcroft & Co., 6545 Epworth Blvd., Detroit.
Swartwout Co., The, 18531 Euclid Ave., Cleveland, O.
Young Brothers Co., 6508 Mack Ave., Detroit, Mich.

MOLDERS—Shovels
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.

MOLDING MACHINES
Adams Co., The, 175 Foster St., Dubuque, Iowa.
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.
Demmler, Wm., & Brothers, Kewanee, Ill.
Hanna Engineering Works, 1761 Elston Ave., Chicago, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh, Pa.
Holley Permanent Mold Machine, Inc., Vancouver & P. M. R. R., Detroit, Mich.
International Molding Machine Co., 2616 W. 16th St., Chicago, Ill.
Johnston & Jennings Co., 877 Addison Rd., Cleveland.
Moline Iron Wks., Moline, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Tabor Manufacturing Co., 6225 Tacony St., Philadelphia, Pa.

MOLDING MACHINES—Permanent Mold
Holley Permanent Mold Machine, Inc., Vancouver & P. M. R. R., Detroit, Mich.

MOLDING MACHINES—Roll Over
Arcade Mfg. Co., Dept D, Freeport, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh, Pa.
International Molding Machine Co., 2616 W. 16th St., Chicago, Ill.
Johnston & Jennings Co., 877 Addison Rd., Cleveland.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Tabor Manufacturing Co., 6225 Tacony St., Philadelphia, Pa.

MOLDING MACHINES—Sand Throwing
Beardsley & Piper Co., 2541 No. Keeler Ave., Chicago, Ill.

MOLDING MACHINES—Squeezer
Adams Co., The, 175 Foster St., Dubuque, Iowa.
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Hanna Engineering Works, 1761 Elston Ave., Chicago, Ill.
International Molding Machine Co., 2616 W. 16th St., Chicago, Ill.
Johnston & Jennings Co., 877 Addison Rd., Cleveland.
Moline Iron Wks., Moline, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Tabor Manufacturing Co., 6225 Tacony St., Philadelphia, Pa.

MOLDING SAND BOND
Illinois Clay Products Co., Joliet, Ill.

MOLDS—Ingot
Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.

MONOGRAMS—Foundry Marks
Shanafelt Manufacturing Co., 1228 Fourth St., S. W., Canton, O.

MONORAIL SWITCHES—and Turntables
Cleveland Electric Tramrail Division of Cleveland Crane & Engineering Co., Wickliffe, O.

NICKEL
American Mond Nickel Co., Century Bldg., Pittsburgh, Pa.
Williams & Co., Inc., 901-37 Penn. Ave., Pittsburgh, Pa.

NICKEL—Alloys
Niagara Falls Smelting & Refining Corp., 2204 Elmwood St., Buffalo, N. Y.

NITROGEN—Gas
Linde Air Products Co., 30 E. 42nd St., New York City.

NOZZLES—Sandblast
Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.
American Foundry Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

OIL—Core—See Core Oil

OIL BURNING SYSTEMS
Foundry Equipment Co., The, 1831 Columbus Rd., Cleveland, O.
Hauck Mfg. Co., 126 Tenth St., Brooklyn, N. Y.

OVENS—Annealing
Whiting Corp., Harvey, Ill.

OVENS—Core—See Core Ovens

OVENS—Enameling, Japanning, etc.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland, O.
Swartwout Co., The, 18531 Euclid Ave., Cleveland, O.
Young Brothers Co., 6508 Mack Ave., Detroit, Mich.

OVENS—Mold—See Mold Ovens

OXY-ACETYLENE EQUIPment—See Welding and Cutting Apparatus and Supplies—Oxy-acetylene

OXY-ACETYLENE WELDing and Cutting—See Welding and Cutting Apparatus and Supplies—Oxy-Acetylene

OXYGEN IN CYLINDERS
Linde Air Products Co., 30 E. 42nd St., New York City.

PACKING—SHEET
Jenkins Brothers, 80 White St., New York City.
Smooth-on Mfg. Co., 572 Communipaw Ave., Jersey City, N. J.

PAINT—Graphite
United States Graphite Co., The, Saginaw, Mich.

PANS—Grinding—See Grinding Pans—Sand

PANS—Tempering
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.
Phillips & McLaren Co., 24th and Smallman Sts., Pittsburgh, Pa.

PARTING COMPOUNDS
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

PATTERN COMPOUND
American Foundry Equipment Co., Mishawaka, Ind.
Menefee Foundry Co., Ft. Wayne, Ind.

PATTERN LETTERS
Chain Products Co., 3924 Cooper Ave., Cleveland, O.
Shanafelt Mfg. Co., 1228 Fourth St., S. W., Canton, O.

PATTERN PLATES—Aluminum
U. S. Aluminum Match Plate Co., 1269 W. 76th St., Cleveland, O.

PATTERN WAX
United Compound Co., 228 Elk St., Buffalo, N. Y.

PATTERNS—Wood, Metal
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh, Pa.

PELLETS—Nickel
American Mond Nickel Co., Century Bldg., Pittsburgh, Pa.

PERMANENT MOLDING Machines—See Molding Machines—Permanent Mold

PIG IRON
Bethlehem Steel Co., Bethlehem, Pa.
Pilling & Co., Inc., 1500 Chestnut St., Philadelphia, Pa.

PILING MACHINES—See Tiering Machines

PINCH DOGS
Diamond Clamp & Flask Co., Richmond, Ind.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above

Efficiency in Core Venting

Is as important as efficiency in core-making. Don't undo the good work of coremakers and sacrifice castings by using an independable vent wax.

Use Buffalo Brand Vent Wax—it is at all times dependable.

Always look for the "Buffalo" on the octagon cardboard spool

BUFFALO BRAND
VENT WAX
SOFT
WAX FOR
Cold Weather
NOTICE.
This wax is sensitive to extreme heat and cold.
If too soft, place in a pail of cold water before unwinding, or, if too hard, warm slightly.
ADVISE US OF ANY TROUBLE.
THANK YOU.

White for liberal testing sample

UNITED COMPOUND CO.

228 Elk Street — BUFFALO, N. Y., U. S. A.

PENOLYN CORE OIL

The giant of core binders. Unusual in strength. Consistently uniform, and, "True to the Core".

Pennsylvania Lubricating Co., Pittsburgh, Pa.

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FOR DEPENDABLE VENTING YOU CAN RELY ON AMERICAN BRAND VENT WAX

If your Supply House can not Supply You—Order Direct.

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64 Market St. — Lockport, N. Y.

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OPEN HEARTH NEW BILLET STOCK

Rolled from *O. H. New Billet Steel* means *less breakage*, with *lower cost per gagger used.* ⅜ and ½ inch round and square—⅝ inch round. Any length leg, toe or hook. *Prompt shipments in any quantity.*

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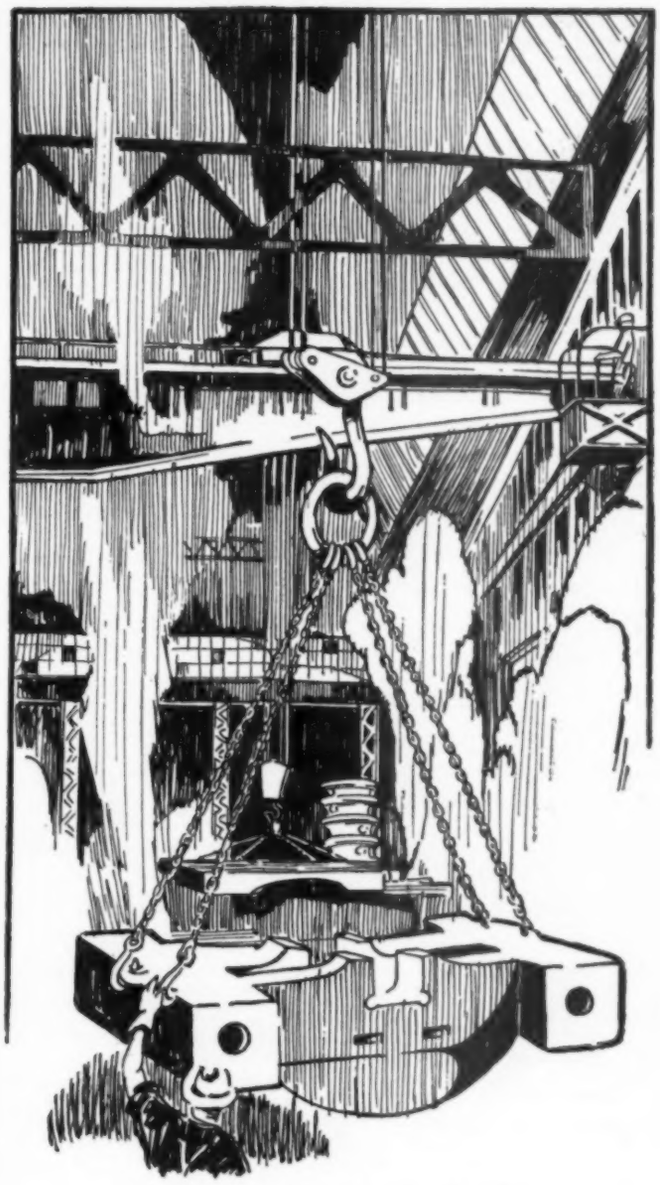
CLEVELAND, OHIO, U.S.A.

From the Ore to the Finished Product



Reduce Casting Cost

By using Dixon's Graphite Facings your castings will lift *unusually clean.* Much time and expense will be saved in cleaning and machining.

Tell us the nature of your work and we will send a liberal testing sample.

Made in Jersey City, N. J., by the

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Dept. 51-S

D X N *Established 1827* D X N

DIXON'S GRAPHITE FACINGS

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PLATES—Rapping
Diamond Clamp & Flask Co., Richmond, Ind.

PLATES—Snap Flask Bottom
Adams Co., 175 Foster St., Dubuque, Iowa
Diamond Clamp & Flask Co., Richmond, Ind.

PLUMBAGO
Dixon, Jos., Crucible Co., Jersey City, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.
United States Graphite Co., Saginaw, Mich.

PNEUMATIC TOOLS—See Tools—Pneumatic

POLISHERS' AND Platers' Supplies
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

POURING DEVICES
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Modern Pouring Device Co., Port Washington, Wis.

POWDERED COAL Plants
Whiitng Corp., Harvey, Ill.

POWER SQUEEZERS—See Squeezers—Hand and Power

PREHEATING APPARATUS
Oxweld Acetylene Co., Newark, N. J.

PULLEYS—Magnetic
Magnetic Mfg. Co., 241 24th Ave., Milwaukee, Wis.

PUMPS
Ingersoll-Rand Co., 11 Broadway, New York City.
Roots, P. H. and F. M., Co., Connersville, Ind.

PUMPS—Air Lift
Chicago Pneumatic Tool Co., 6 East 44th St., New York City
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 S. Michigan Ave., Chicago, Ill.

PUMPS—Gas
Roots, P. H. & F. M., Co., Connersville, Ind.

PUMPS—Liquid Handling
Roots, P. H. & F. M., Co., Connersville, Ind.

PYROMETERS
Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.

PYROSCOPES
Shore Instrument & Mfg. Co., Inc., Van Wyck Ave. and Carll St., Jamaica, L. I., New York.

RAILWAY EQUIPMENT—Cars, Industrial, etc.
Bethlehem Steel Co., Bethlehem, Pa.

RAMMERS—Sand Pneumatic—See Sand Rammers—Pneumatic

RAMMERS—Sand Slinger
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.

RAPPING PLATES
Shanafelt Mfg. Co., 1228 Fourth St., S. W., Canton, O.

RECLAIMERS—Sand—See Sand Reclaimers

REGULATORS—Compressed Air
Oxweld Acetylene Co., Newark, N. J.

RESPIRATORS
Pulmosan Safety Equipment Corp., 172 Johnson St., Brooklyn, N. Y.

RIDDLES
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.

RIDDLES—Pneumatic
Adams Co., The, 175 Foster St., Dubuque, Iowa.

RIVETERS—See Hammers—Chipping and Riveting—Pneumatic

RODS—Iron & Steel
Bethlehem Steel Co., Bethlehem, Pa.

RODS—Welding—See Welding Rods and Wire

ROLLER BEARINGS
Hyatt Roller Bearing Co., Harrison, N. J.

SAND
Cape May Sand Co., Cape May, N. J.
Ottawa Silica Co., Ottawa, Ill.
Portage Silica Co., 602 Stambaugh Bld., Youngstown, O.

SAND—Core
Cape May Sand Co., Cape May, N. J.
Ottawa Silica Co., Ottawa, Ill.
Pennsylvania Foundry Supply Co., Liberty Bldg., Philadelphia, Pa.
Portage Silica Co., 602 Stambaugh Bldg., Youngstown, O.
Whitehead Brothers Co., 537 W. 27th St., New York City.

SAND—Molding
Keener Sand & Clay Co., 514 Hartman Bldg., Columbus, O.
Ottawa Silica Co., Ottawa, Ill.
Pennsylvania Foundry Supply Co., Liberty Bldg., Philadelphia, Pa.
Portage Silica Co., 602 Stambaugh Bldg., Youngstown, O.
Whitehead Brothers Co., 537 W. 27th St., New York City.

SAND—Sandblast
Cape May Sand Co., Cape May, N. J.
Northern Gravel Co., Muscatine, Ia.
Ottawa Silica Co., Ottawa, Ill.
Pangborn Corp., Hagerstown, Md.
Portage Silica Co., 602 Stambaugh Bldg., Youngstown, O.
Whitehead Brothers Co., 537 W. 27th St., New York City.

SAND—Silica
Ottawa Silica Co., Ottawa, Ill.

SAND—Steel Molding
Cape May Sand Co., Cape May, N. J.
Ottawa Silica Co., Ottawa, Ill.
Portage Silica Co., 602 Stambaugh Bldg., Youngstown, O.
Whitehead Brothers Co., 537 W. 27th St., New York City.

SANDBLAST ABRASIVES—Steel Shot and Grit
American Foundry Equipment Co., Mishawaka, Ind.
American Steel Abrasives Co., Galion, O.
Globe Steel Abrasive Co., Dept. F, Mansfield, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.

SANDBLAST EQUIPMENT and Accessories
American Foundry Equipment Co., Mishawaka, Ind.
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Direct Separator Co., Inc., Syracuse, N. Y.
Koven, L. O., & Brother, Inc., 154 Ogden Ave., Jersey City, N. J.
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., The, 4702 Train Ave., Cleveland, O.

SANDBLAST NOZZLES—See Nozzles—Sandblast

SANDBLAST SHOT—Steel See Shot—Steel Sandblast

SANDBLAST TUMBLING Barrels—See Tumbling Barrels

SAND CONTROL MAchines
Dietert, Harry W., 1275 Casgrain Ave., Detroit, Mich.

SAND CONVEYING AND Handling Equipment
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.

SAND CUTTING MAchines
American Foundry Equipment Co., Mishawaka, Ind.

SAND DRYERS
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Pangborn Corp., Hagerstown, Md.

SAND GRINDING PANS—See Grinding Pans—Sand

SAND MIXERS AND Cutters
American Foundry Equipment Co., Mishawaka, Ind.
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Royer Foundry & Machine Co., Kingston Sta., Wilkes-Barre, Pa.

SAND PREPARATION & Distributing Systems
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.

SAND RAMMERS
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.

SAND RAMMERS—Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.
Cleveland Pneumatic Tool Co., 3734 E. 78th St., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

SAND RECLAIMERS
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.

SAND SIFTERS AND Screening Machines
Adams Co., The, 175 Foster St., Dubuque, Iowa.
American Foundry Equipment Co., Mishawaka, Ind.
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.
Hanna Engineering Works, 1761 Elston Ave., Chicago, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Robins Conveying Belt Co., 15 Park Row, New York City
Royer Foundry & Machine Co., Kingston Sta., Wilkes-Barre, Pa

SANDSLINGERS
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.

SAND STORAGE BINS and Gates
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SAND TESTING Equipment
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.

SAWS—Cold Inserted Tooth
Tabor Mfg. Co., 6225 Tacony St., Philadelphia, Pa.

SAWS—Cold Metal
Tabor Mfg. Co., 6225 Tacony St., Philadelphia, Pa.

SAWS—Hack
American Saw & Mfg. Co., Springfield, Mass.

SAWS—Metal Band
American Saw & Mfg. Co., Springfield, Mass.

SCALING HAMMERS
Ingersoll-Rand Co., 11 Broadway, New York City.

SCLEROSCOPES
Shore Instrument & Mfg. Co., Inc., Van Wyck Ave. and Carll St., Jamaica, L. I., New York.

SCREENS—Sand
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above

"CAPE MAY" Sand

CAPE MAY SAND CO
CAPE MAY CITY, N.J.

When you buy from the Cape May Sand Company you are sure of the two important essentials to satisfaction in any business transaction — **QUALITY** and **SERVICE** — and we know most men like to do business on that basis.

You'll Like It!

Cape May Sand Company
512 Washington St., Cape May, N. J.

"Standard" Sand Blast Sands
"A Quality that Counts"
Produced by
Northern Gravel Co. Muscatine, Iowa

For STEEL MOLDING and SAND-BLASTING

PORTAGE SANDS
OVER 98% SILICA

The PORTAGE SILICA CO.
Youngstown, Ohio

PATTERN LETTERS
THE CHAIN PRODUCTS CO., Cleveland, Ohio, U. S. A.

"L&A" ELECTRIC VIBRATOR
The original electric vibrator—and still first in effectiveness.
Send for full details.
The Pressed Steel Co.
Muskegon, Mich.

Whitehead's Foundry Sands

are laboratory controlled and foundry tested

We are amply equipped and prepared to furnish the proper sand for any variety of casting, having unexcelled resources and facilities. We are producers and shippers of Albany and North River Molding Sand, New Jersey Molding Sand, Lumberton Sand, Millville Gravel, Cattarugus Molding Sand, Windsor Lock Molding Sand, Strong and Sharp Silica Steel Molding Sand, Furnace Bottom Sand, Screened Jersey Fire Sand, Jersey Fire Clay, Kaolin and Cupola Daub, Core Sands and Blast Sands. Importers of French Sand.

We also carry in our various warehouses a complete line of foundry supplies.

WHITEHEAD BROTHERS COMPANY
Providence NEW YORK Buffalo
FOUNDRY SANDS, SUPPLIES AND EQUIPMENT

SEACOAL
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland, O.
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

SEPARATORS—Air, Moisture, Oil
Pangborn Corp., Hagerstown, Md.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.
Smith-Monroe Co., 223 South Main St., South Bend, Ind.
Swartwout Co., The, 18531 Euclid Ave., Cleveland, O.

SEPARATORS—Magnetic and Electro Magnetic of all Kinds
Magnetic Mfg. Co., 241 24th Ave., Milwaukee, Wis.

SEPARATORS—Sand
Magnetic Mfg. Co., 241 24th Ave., Milwaukee, Wis.
National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.
Pangborn Corp., Hagerstown, Md.
Royer Foundry & Machine Co., Kingston Sta., Wilkes-Barre, Pa.

SHAFTING—Flexible
Stow Mfg. Co., Binghamton, N. Y.

SHAFTING HANGERS—Roller Bearing
Hyatt Roller Bearing Co., Harrison, N. J.

SHOT—Steel, Sandblast
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.
Steel Shot & Grit Co., 61st and A. V. Ry., Pittsburgh, Pa.

SHOT AND GRIT—Sandblast
American Steel Abrasives Co., Galion, O.
Globe Steel Abrasive Co., Dept. F, Mansfield, O.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.

SHOVELS
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.

SKIMMERS
Aluminum Foundry Equipment Co., 319 Plymouth Bldg., Cleveland.

SKIP HOISTS
Bartlett, C. O., & Snow Co., 6201 Harvard Ave., Cleveland, O.

SLIP JACKETS—Steel
Adams Co., The, 175 Foster St., Dubuque, Iowa.
Diamond Clamp & Flask Co., Richmond, Ind.

SNAP FLASK BOTTOM Plates—See Plates—Bottom Snap Flask

SNAP FLASK TRIMMINGS
Adams Co., The, 175 Foster St., Dubuque, Iowa.

SNAP FLASKS—See Flasks

SNAP MOLD JACKETS—See Jackets—Snap Flask and Mold

SNAP STEEL TRIMMINGS
Diamond Clamp & Flask Co., Richmond, Ind.

SODA ASH
Mathieson Alkali Works, Inc., 250 Park Ave., New York City.

SPIEGELEISEN
Bethlehem Steel Co., Bethlehem, Pa.

SPLIT PATTERN MAchines
Tabor Mfg. Co., 6225 Tacony St., Philadelphia, Pa.

SPRUE CUTTERS
Adams Co., The, 175 Foster St., Dubuque, Iowa.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland, O.

SQUEEZERS—Hand and Power
Adams Co., The, 175 Foster St., Dubuque, Iowa.
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Johnston & Jennings Co., 877 Addison Rd., Cleveland.
Moline Iron Wks., Moline, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia, Pa.

STAMPINGS
Hydraulic Pressed Steel Division, (Truscon Steel Co.) 6100 Hydraulic Ave., Cleveland.

STARS—Foundry Twisted
Franklin Core Rod & Gagger Co., Franklin, Pa.

STARS—Tumbling Mill
Ervin Foundry & Mfg. Co., 930 E. Michigan St., Adrian, Mich.
Franklin Core Rod & Gagger Co., Franklin, Pa.
Johnston & Jennings Co., 877 Addison Rd., Cleveland.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.

STEEL
Bethlehem Steel Co., Bethlehem, Pa.

STEEL—High Speed
Bethlehem Steel Co., Bethlehem, Pa.

STEEL—Structural
American Bridge Co., 71 Broadway, New York City.
Bethlehem Steel Co., Bethlehem, Pa.

STEEL BANDS
Adams Co., The, 175 Foster St., Dubuque, Iowa.
Diamond Clamp & Flask Co., Richmond, Ind.
Shanafelt Mfg. Co., 1228 4th St., S. W., Canton, Ohio.

STEEL BARGES
American Bridge Co., 71 Broadway, New York City.

STEEL SHOT
American Steel Abrasives Co., Galion, O.
Globe Steel Abrasive Co., The, Mansfield, O.
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.

STEEL TOWERS
American Bridge Co., 71 Broadway, New York City.

TALC
Stevens, Frederic B., Inc., Larned and Third Sts., Detroit, Mich.

TIERING MACHINES
Standard Conveyor Co., 315 Second Ave., North St. Paul, Minn.

TITANIUM
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

TONGS—Shake Out
Diamond Clamp & Flask Co., Richmond, Ind.

TOOL GRINDERS
Tabor Mfg. Co., 6225 Tacony St., Philadelphia, Pa.

TOOLS—Electric Portable
Chicago Pneumatic Tool Co., 6 East 44th St., New York City.
Stow Mfg. Co., Binghamton, N. Y.

TOOLS—Pneumatic
Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.
Cleveland Pneumatic Tool Co., 3734 E. 78th St., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.
Rotor Air Tool Co., 5900 Carnegie Ave., Cleveland, O.

TORCHES AND BURNERS—Acetylene, Blow, Oxy-Acetylene
Oxweld Acetylene Co., Newark, N. J.

TRACK & RAIL SUPPLIES
Bethlehem Steel Co., Bethlehem, Pa.

TRACKS—Overhead
Chisholm-Moore Hoist Corp., (Division of Columbus-McKinnon Chain Co.), Fremont Ave., Tonawanda, N. Y.

TRAMRAIL SYSTEMS
Cleveland Electric Tramrail Division of Cleveland Crane & Engineering Co., Wickliffe, O.
Whiting Corp., Harvey, Ill.

TROLLEYS
Chisholm-Moore Hoist Corp., (Division of Columbus-McKinnon Chain Co.), Fremont Ave., Tonawanda, N. Y.
Curtis Pneumatic Machinery Co., 1573 Kienlen Ave., St. Louis, Mo.
Euclid Crane & Hoist Co., The, Euclid, Ohio.
Harnischfeger Corp., 3800 National Ave., Milwaukee, Wis.

TRUCKS—Electric Industrial
Whiting Corp., Harvey, Ill.

TRUCKS—Foundry
Whiting Corp., Harvey, Ill.

TRUCKS—Welding
Oxweld Acetylene Co., Newark, N. J.

TUMBLING BARRELS
American Foundry Equipment Co., Mishawaka, Ind.
Arcade Mfg. Co., Dept. D, Freeport, Ill.
Koven, L. O., & Brother, Inc., 154 Ogden Ave., Jersey City, N. J.
New Haven Sand Blast Co., New Haven, Conn.
Pangborn Corp., Hagerstown, Md.
Scully-Jones & Co., 2012 W. 13th St., Chicago, Ill.
Sly, W. W., Mfg. Co., 4702 Train Ave., Cleveland, O.
Whiting Corp., Harvey, Ill.

TURBO BLOWERS—See Blowers

TURNTABLES
Beardsley & Piper Co., 2541 N. Keeler Ave., Chicago, Ill.
Whiting Corp., Harvey, Ill.

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VALVES—Air
Jenkins Bros., 80 White St., New York City.

VALVES—Back Pressure
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VALVES—Blow-off and Cut-off
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.

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VARNISH CANS—For Pattern Shops
Diamond Clamp & Flask Co., Richmond, Ind.

VENTILATING SYSTEMS
Swartwout Co., The, 18531 Euclid Ave., Cleveland, O.

VIBRATORS
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Arcade Mfg. Co., Dept. D, Freeport, Ill.
Hanna Engineering Works, 1761 Elston Ave., Chicago, Ill.
Johnston & Jennings Co., 877 Addison Rd., Cleveland.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Pressed Steel Co., Muskegon, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia, Pa.

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WIRE—Welding—See Welding Rods and Wire

WIRE BRUSHES—See Brushes—Wire

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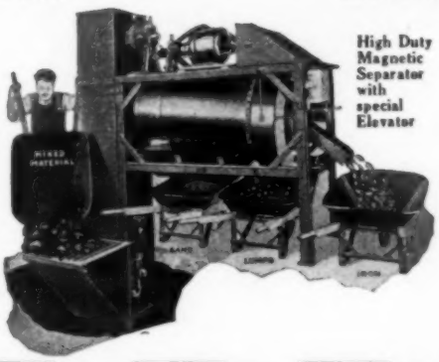

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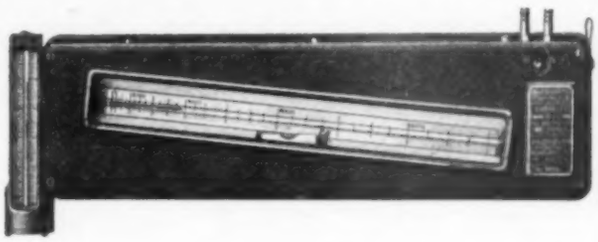

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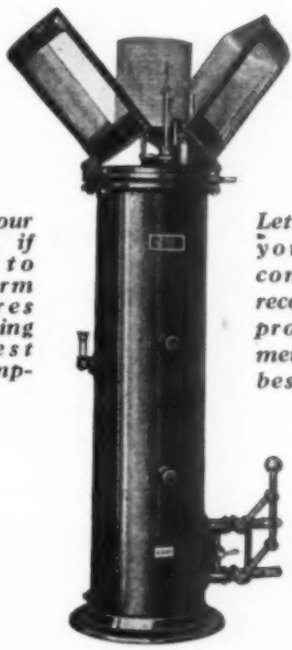

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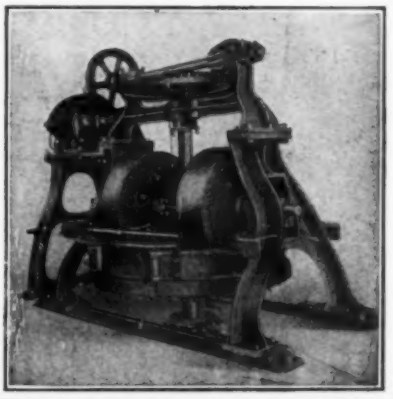

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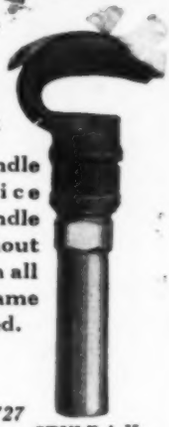

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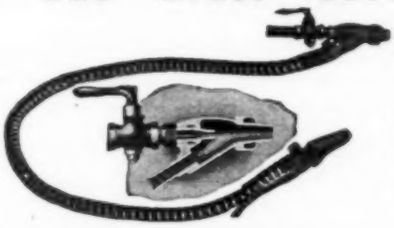

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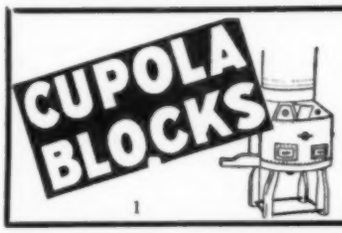

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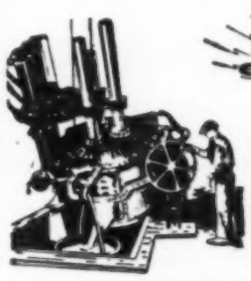

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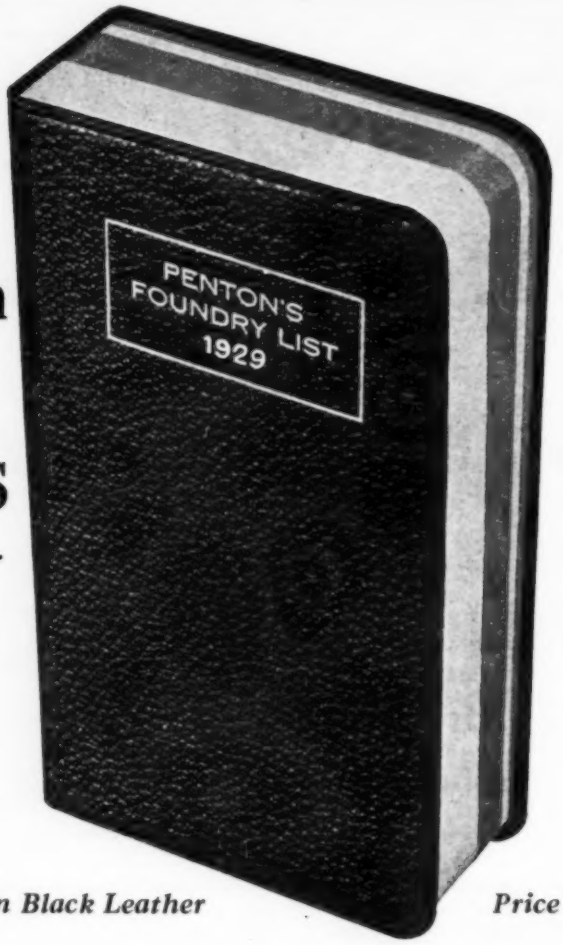

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Penton Bldg., Lakeside Ave. and W. 3rd St.
CLEVELAND, OHIO

Date.....

Enclosed is $25.00 for which kindly send at once, all charges prepaid, one copy of the 1929 edition of *PENTON'S FOUNDRY LIST.*

Name.....

Address.....

162 IFAD

Classified Ads

Help Wanted

NONFERROUS SUPERINTENDENT

Old established jobbing foundry in Middle East making brass bronze and aluminum castings, contemplating reorganization, wants to correspond with experienced foundryman capable of taking entire charge of plant, in anticipation of assuming part ownership if services are satisfactory.

Must be a man of good character and habits, practical, energetic, and progressive and able to contribute something of constructive character to the reorganization. Capital desirable but not necessary.

State age, experience, present employment and compensation and any other information of interest. Replies will be considered strictly confidential. Address Box 380, THE FOUNDRY, Cleveland.

GENERAL FOUNDRY FOREMAN

Highly specialized factory located in Sweden and manufacturing water turbines and regulators is looking for general foundry foreman. He must be responsible only to the chief engineer. The foundry has a capacity of two to three thousand tons of iron and five to seven tons of bronze yearly.

This man must have metallurgical experience as well as actual foundry practice. The forming methods used are dry and green sand and molding machines. Only competent men need reply. Best of reference required. Write giving age and salary desired. Address Box 416, THE FOUNDRY, Cleveland.

$3000-$30,000 MEN FIND OUR SERVICE effective in making connections. Individual. Confidential. Personally planned by JACOB PENN. All foundry owners and officials know him, believe in him. Not agency. Jacob Penn, Incorporated, 9 Park Place, New York.

WANTED

Practical general foundryman to operate small foundry for half of profits. Growing concern, having own line of specialties in gray iron, semisteel, aluminum and brass. Located in Northern Ohio. For further particulars address Box 411, THE FOUNDRY, Cleveland, O.

WANTED

General Foreman for Malleable Foundry in Western New York State. State age, experience and salary expected. Address Box 439, THE FOUNDRY, Cleveland.

IF YOU ARE OPEN TO OVERTURES FOR new connection, and qualified for a salary between $2500 and $25,000, your response to this announcement is invited. The undersigned provides thoroughly organized service, of recognized standing and reputation, through which preliminaries are negotiated confidentially for positions of the calibre indicated. The procedure is individualized to each client's personal requirement; your identity covered and present position protected. Established nineteen years. Send only name and address for details. R. W. Bixby, Inc., 101 Downtown Building, Buffalo, New York.

WANTED FOUNDRY ENGINEER

Experienced in layout, design and equipment of modern production foundries. In reply state age, experience in detail and salary expected. Address Box 398, THE FOUNDRY, Cleveland.

CLASSIFIED RATES

For Sale, Wanted and Miscellaneous advertisements; 10c per word, minimum advertisement $3.00.

Help Wanted advertisements; minimum ad, 50 words $3.00; additional words 6c each.

Position Wanted advertisements; minimum ad, 30 words $1.50, additional words 5c each.

First line is set in bold face type.

A box address counts as six words.

Those desiring to give special prominence to their advertisements may buy space by the inch and have their advertisements appear in bold face type with white space at top and bottom, at the following rates:

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8" "	50.00	45.00	40.00	35.00
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15" (¼ page)	90.00	80.00	70.00	60.00
30" (1 page)	160.00	140.00	120.00	100.00

Count 10 lines to the inch for actual type matter and allow accordingly when white space is desired.

THE FOUNDRY is published on the 1st and 15th of each month. Copy for the classified section should reach us twelve days before date of issue.

Help Wanted

SANITARY WARE PLANT IN SOUTH America has opening for high-grade foundry superintendent. Must be expert in sand control, operating sandslinger machines, cupola practice, with quality and quantity production of light, smooth castings. One who has also practice in stove-plate and speaks Spanish or Czechoslovac preferred. Write fully regarding experience, where employed and age, stating salary expected. Confidential. Address Box 418, THE FOUNDRY, Cleveland.

MR. FOUNDRYMAN

If you are anxious to locate a position, get in touch with the executives of the largest foundries throughout the world through the classified section of THE FOUNDRY.

Just write us giving your past experience, the position you want and any information which will be of interest to prospective employers. Also tell us the number of words that you would like to use in your ad. The cost is 5 cents per word, minimum ad $1.50 per issue.

Address your letter to the Classified Ad. Dept., THE FOUNDRY, Cleveland. We'll try to do all we can to make up an advertisement that will draw results.

WANTED

Superintendent with mechanical engineering education and training for factory operating foundry and enameling department. In reply give full information including references. Address Box 431, THE FOUNDRY, Cleveland.

Help Wanted

GRAY IRON FOUNDRY FOREMAN FOR modern foundry located in the East making extra heavy cast iron pipe fittings. Must be thoroughly experienced in pattern gating, cupola melting, sand control, and production of pipe fittings. Give age, experience, nationality, and salary expected in first letter. All replies confidential. Address Box 408, THE FOUNDRY, Cleveland.

WANTED

First class experienced cleaning room foreman in light steel castings. Foundry now producing some 400 tons per month. Address The West Steel Casting Company, 805 East 70th St., Cleveland.

WANTED

Practical foundryman to assist in instructing molders. Must be experienced in bench, floor and squeezer work. Address Box 399, THE FOUNDRY, Cleveland.

HELP WANTED

Draftsman, experienced in designing cupolas, ladles and foundry equipment. Excellent opportunity for experienced man. Address Box 386, THE FOUNDRY, Cleveland.

WANTED

Experienced steel foundryman, capable of handling sand slinger with all its requirements, rigging, molding, and equipment. Apply West Steel Casting Company, 805 East 70th St., Cleveland, O.

Positions Wanted

YOUNG STEEL FOUNDRY FOREMAN, 36 years of age, experienced on both floor and machine, green and dry sand and all classes of castings, wishes connection. Can furnish best of reference. Address Box 233. THE FOUNDRY, Cleveland.

PRACTICAL BRASS FOUNDRY SUPER-intendent having broad experience desires position. Would consider position as foreman in large shop. Has ability to handle men and is thoroughly familiar with foundry business. Address Box 812, THE FOUNDRY, Cleveland.

BUSINESS ADVISOR. EXPERIENCED Foundryman desires one large client for full time or willing to divide time between two or three small Eastern foundries; either gray iron or malleable. Thoroughly experienced both in manufacturing and selling. Willing to take part salary and percentage of earnings. You must know how to apply the best of modern methods to keep in business today and this has been my job. Write me candidly of your situation and I will tell you if I can be of service. Address Box 407, THE FOUNDRY, Cleveland.

POSITION WANTED AS FOUNDRY SUPER-intendent or foreman. 16 years experience in stove, furnace, and light gray iron jobbing foundries, familiar with molding machines. Address Box 997, THE FOUNDRY, Cleveland.

Classified Ads

Positions Wanted

GRAY IRON FOUNDRYMAN DESIRES POSITION as Superintendent or Foreman in medium or small gray iron foundry. Thoroughly experienced in green, dry sand and loam work including marine and turbine cylinders, condensers, pumps, hydraulic presses as well as rolling mill and blast furnace work. He has held positions as both Superintendent and Foreman. Now employed but desires change. McLain graduate. Married. Address Box 427, THE FOUNDRY, Cleveland.

A PRACTICAL MOLDER, AGE 40, WITH wide experience on cupola, mixing iron, semi-steel by analysis, desires position as general foreman. Have best of references. Address Box 410, THE FOUNDRY, Cleveland.

FOUNDRY SUPERINTENDENT
Practical foundryman with 25 years experience in all branches of foundry operation desires position. Has made complete study of molding machines and quality production. Graduate metallurgist. Now employed but desires change. Southern territory preferred. Address Box 443, THE FOUNDRY, Cleveland.

MASTER MECHANIC. FIFTEEN YEARS experience in modern steel foundries, in maintenance of mechanical and electrical equipment. Also the efficient operation and construction of large electric furnaces. Address Box 392, THE FOUNDRY, Cleveland.

GENERAL MANAGER WITH ESTABLISHED record in successfully managing and building up foundry, machine, tool and allied industries desires position where his qualifications and previous experience will produce results. His experience includes direct responsibility for all office, sales, financial and factory activities. Address Box 441, THE FOUNDRY, Cleveland.

FOUNDRY FOREMAN WITH 25 YEARS experience in stove, furnace and light gray iron work, desires position. References. Address Box 379, THE FOUNDRY, Cleveland.

CHIEF CHEMIST—METALLURGIST WITH seventeen years experience in open hearth, electric furnace, cupola, malleable iron, carbon alloy, manganese steel and heat treatment, desires position. Has had wide experience in metallurgical control, understands foundry practice. Now employed but desires change. Location immaterial. Address Box 433, THE FOUNDRY, Cleveland.

YOUNG MAN WITH TWO YEARS EXPERIENCE desires to finish apprenticeship in large foundry having patternshop where he may serve as apprentice patternmaker. 23 years old, high school graduate. Address Box 442, THE FOUNDRY, Cleveland.

FOUNDRYMAN WITH OVER 20 YEARS experience desires position as Superintendent. For a number of years have made a complete study of molding machines and quantity production at lowest cost. Have managed union and open shops running 30 to 190 tons daily. Employed at present but desire change. Good living and working conditions first consideration, salary secondary. Best References. Address Box 908, THE FOUNDRY, Cleveland.

PATTERN FOREMAN DESIRES POSITION. Technically trained, reliable, energetic, inventive, resourceful. Broadly experienced in wood and metal patterns and foundry rigging. Competent to assume executive responsibilities in gray iron foundry and factory. 15 years foreman and factory superintendent. Excellent references. Moderate salary. Investment considered. Address Box 444, THE FOUNDRY, Cleveland.

Positions Wanted

POSITION AS FOREMAN OR SUPERINTENDENT of steel foundry. Practical molder and electric steel melter. Age 38, best of references. Address Box 428, THE FOUNDRY, Cleveland.

POSITION WANTED AS SUPERINTENDENT of gray iron or steel foundry by man having 18 years experience in manufacture of pipe, sanitary ware and jobbing work. Best of references. Address Box 436, THE FOUNDRY, Cleveland.

ATTENTION
FOUNDRY OWNERS!

Write or wire us for technically-trained, practical foundry foremen, superintendents, production managers, chemists, metallurgists, core foremen, cost clerks, salesmen, patternmakers, melters (electric, open-hearth, converter and cupola). No charge.

McLAIN'S SYSTEM, INC.
804 GOLDSMITH BLDG.
MILWAUKEE, WIS.

YOUNG MARRIED MAN, TECHNICAL training in foundry operation, chemistry and metallography; 6 years sales and management work wants opportunity for the future. New England territory preferred. Anxious to develop for mutual benefit. Address Box 430, THE FOUNDRY, Cleveland.

MR. EMPLOYER!
ARE YOU
LOOKING AHEAD?

You want the best men available for every department of your plant.

And if you do not pick experienced men now, it may be impossible to suitably fill your vacancies later.

Do you realize that just such men are watching this page waiting to go after the opportunity you have to offer?

Your use of the Help and Position Wanted columns will convince you that real wideawake men are interested now—and when you receive your replies, be kind enough to answer all of them, if only to return the letter stating that the position has been filled.

ANNEALING ROOM FOREMAN WITH long experience in hand pulverized coal and oilfiring is open for position. Address Box 437, THE FOUNDRY, Cleveland.

POSITION WANTED
Malleable superintendent well acquainted with modern foundry practices. Can mix iron by analysis. Best references. Address Box 435, THE FOUNDRY, Cleveland.

WANTED
Position by a malleable foundryman with wide experience on all classes of work. Ten years with last company. A1 reference from past employer. Address Box 438, THE FOUNDRY, Cleveland.

YOUNG MAN 35 YEARS OLD DESIRES position in malleable iron foundry. Eastern Pennsylvania. 10 years experience. Start at anything offering advancement. Address Box 432, THE FOUNDRY, Cleveland.

Positions Wanted

PRACTICAL BRASS FOUNDRY FOREMAN desires position as working foreman thoroughly familiar wth chandelier valves, jobbing or production. Age 37. Address Box 311, THE FOUNDRY, Cleveland.

FIRST CLASS PRACTICAL MALLEABLE foundryman desires new connection in an executive capacity. Well versed in all phases of manufacture of malleable castings. For past 5 years have been assistant general manager of a well known malleable foundry. Address Box 434, THE FOUNDRY, Cleveland.

GRAY IRON FOUNDRY SUPERINTENDENT at present employed desires position. During the past 20 years he has proven his ability as foreman and superintendent of a number of large concerns. Only interested in position with large or medium foundry. Address Box 302, THE FOUNDRY, Cleveland.

FOUNDRYMAN WITH SOME SALES EXPERIENCE and twenty years practical experience desires position as salesman. Well known throughout trade in Ohio, Pennsylvania and New York. References. Steel foundry foreman last six years. Address Box 423, THE FOUNDRY, Cleveland.

GRAY IRON FOUNDRY SUPERINTENDENT Open for engagement. 35 years practical experience on light and heavy castings, 15 years as foundry superintendent. Well versed in modern production methods; also brass. Best references. Address Box 422, THE FOUNDRY, Cleveland.

POSITION AS ASSISTANT MANAGER OR pattern superintendent. Have had ten years experience as pattern foreman and fourteen years experience in both steel and malleable foundries. Am expert in estimating, gating, heading, and rigging both wood and metal patterns for production. Can handle men to best advantage. Address Box 419, THE FOUNDRY, Cleveland.

FIRST CLASS COREROOM FOREMAN open for position. Has worked on all classes of work, heavy and light. Fifteen years experience in running corerooms. Can save some company that requires a good man money. Address Box 425, THE FOUNDRY, Cleveland.

WANTED
Position as manager or superintendent of steel foundry by up-to-date steel foundry executive. Private interview on request. Address Box 421, THE FOUNDRY, Cleveland.

DESIRE CONNECTION AS PATTERN SHOP foreman with iron or steel foundry, experienced in wood and metal, up-to-date rigger for molding machines. Good executive. References. Address Box 404, THE FOUNDRY, Cleveland.

FOUNDRY CHEMIST AND METALLOGRAPHIST, electric furnace experience, capable of handling Pyrometers and annealing furnace work. Ten years experience in iron and steel alloy analysis. Address Box 362, THE FOUNDRY, Cleveland.

STEEL FOUNDRY FOREMAN EXPERIENCED in large and small work, and dry and green sand desires position. Best references. Address Box 424, THE FOUNDRY, Cleveland.

PRACTICAL MOLDER, KEEN AND ALERT, desires position as foreman or assistant. 30 years experience. Mix by analysis for all castings. Best cupola practice. Good rigger. Can handle men to get production. 5 years as foreman. McLain graduate. Best references. Moderate salary until ability is proven. Address Box 413, THE FOUNDRY, Cleveland.

Classified Ads

For Sale

FOR SALE

All equipment for the operation of 45 ton foundry including such items as

No. 9½ Whiting Cupola
Buggy Ladles
Molding Machines
Tumbling Mills
Batch Mixers
And Other Accessories

Write for complete list and prices

CLARAGE FAN COMPANY
KALAMAZOO, MICH.

FOR SALE

Blower, No. 7 Sturtevant, ten-inch diameter outlet. Very good condition. Pontiac Foundry & Machine Co., Scott Lake Road & Dixie Highway, Pontiac, Mich.

FOR SALE

No. 5 Continuous Cupola—Whiting—First Class Condition. The West Steel Casting Company, Cleveland.

FOR SALE

Rockford planer, 48" x 48" x 16', 2 heads on rail. Betts slotter. Osborns, 404 R. O. Jolt. Osborns 403, Internationals and others. Flasks, coreplates, Whiting cupolas, electric furnaces, converters, Pangborn sandblast. Other foundry equipment. Radial drill and other machine shop tools. Steel and gray iron foundry disposing of equipment. McCord & Company, 847 W. 120th St., Chicago.

NEW 14 OZ. PRESSURE FAN BLOWER. motor, switch, oil pump, gauge, strainer, relief valve, check valve mounted on cast base, three burners, unit large enough for three 250 lbs. furnaces. Equipment guaranteed. Price $425.00 f.o.b. your freight station. Griffoul Burner & Eng. Co., San Jose, Cal.

MOLDING MACHINES

1 Davenport No. 48, power roll-over machine, table 46" x 60"—12" draw.
2 Tabor Power Squeezing Split Pattern Machines, flask 13 x 18", 3" draw, 10" dia. cylinder.
2 Osborn No. 449L Stripping Plate Jolt, 5" cyl., 8" pattern draw, 20 x 29" table.
2 Osborn No. 403 roll-over Jolt, flask cap. 44 x 42", pattern draw 12", lifting cap. 1000 lb.
3 Osborn No. 404 roll-over Jolt with car, flask capacity 52 x 54", pattern draw 15".
1 Osborn No. 406-S Jolt Stripper, jolt. cap. 5000 lbs., 18" pattern draw 42 x 75" table.
1 International Type J 21 x 25" table, 5" cyl.
1 International Type M, 18"—8" draw, comb. jar ramming, turn over draw, with vibrator.
1 International Type F, 30 x 12"—comb. jar ramming, power turn-over, foot draw.
1 International Type F—48 x 16" draw, jar-ram, power turn-over power-draw.

ELECTRIC CRANES—HOISTS

2 5-ton Shepard Cranes, floor control, 220V DC, one-motor Standard Type with one Hoist.
1 4-ton Northern Hoist, 220V DC with trolleys, 2-motor, floor control.
1 Harnischfeger 3-ton Type "U" Hoist with motor drive for Trolley.
4 2-ton Shepard Hoists, Class A-4, 220V D.C. one-motor, plain trolley control.
1 ½-ton Shepard Type IS-Zobel 110-V D. C. Motor.
1 Milwaukee Crane Trolley 10-ton to run on rails 7'0" center, 230-V D. C. Motors.
6 2-ton single I Beam Shepard Bridge, 12" I beam span 18'5" with structural steel trucks.
1 E C & M Type "SA"—55" dia. Magnet.

Our list No. 56 contains complete line of NEW and USED FOUNDRY EQUIPMENT bargains and we would be pleased to quote on your exact requirements.

SCULLY-JONES & COMPANY
19TH & SO. ROCKWELL ST., CHICAGO, ILL.

For Sale

FOR SALE

Two type K sand cutting machines of the American Foundry Equipment Company make including 20 H. P. Buda engines. Equipment in excellent condition. Campbell, Wyant & Cannon Foundry Company, Muskegon Heights, Michigan.

MOLDING MACHINES

2—28" Davenport Jolt Rollovers.
3—24" Davenport Jolt Rollovers.
3—20" x 20" Davenport Jolt Strippers.
2—24" x 24" Davenport Jolt Strippers.
1—No. 1 U. S. Jolt Stripper Squeeze.
1—36" x 72" Pridmore Elec. Jolt Air Strip.
2—No. 81 Osborn Jolt Squeeze Strip.
3—12" x 16" Type "TJ" Int. Jolt Strip.
2—No. 1 Arcade Modern Machines.
2—No. 2 Arcade Modern Machines.
2—Model "E" Berkshire Hand Squeezers.
2—30" x 10" dr. Int. Rollovers.
1—No. 814 Grimes Rollover, 44" x 60" x 14" dr.
2—36" x 48" Osborn Plain Jolts.
2—24" x 36" Norcross Plain Jolts.
12—Hand Ram Rollover Draw Mchs.
28—Hand Ram Strippers.

All our Molding Machines are thoroughly Re-Manufactured and guaranteed to be in first class working condition.

CHAMPION FOUNDRY & MACHINE CO.
3016 West 21st Place
Chicago, Ill.

FOR SALE

One Sly Tumbling Barrel 60" dia. x 72", Friction Drive, ¾" Shell. Excellent condition. Priced low. Little Brothers Foundry Co., Port Huron, Michigan.

TREMENDOUS LIQUIDATION LARGEST foundry Cincinnati district. Hot air furnace production. Cupolas, blowers, compressors, sand blast tables, cranes, molding machines, dust arrestors, arc and spot welders, overhead trolley track, ladles, Fisher brass furnaces, conveyors, core ovens, sand distributors, square and round mills, magnetic separators, air hoists, fans, exhausters, sheet metal machinery, machine tools. Everything for the foundry. Write us stating your needs. Positive bargains and money savers. Inspection invited. Hausfeld brass and smelting furnaces.

CLIFTON MACHINERY CO.
1023 West 6th St. Cincinnati, Ohio.

FOR SALE

1—Buffalo Forge
2—No. 10 Cupola Blowers
4—Electric Power Riddles
6—Berkshire model E Power Squeezers

1 ton single I beam—motor driven crane span 27', 6¼" from center to center. 30 lb. T rail crane equipped with one one-time motor driven special low head room electric hoist with all controls located on bridge.

Crane bridge speed 180 ft. per minute.
Trolley travel speed 90 ft. per minute.
Hoist speed 20 ft. per minute.

Can be seen.

Lake City Malleable Co.
5046 Lakeside Ave.
Cleveland

Foundries For Sale

FOR SALE

Large foundry 90 miles from Chicago in Illinois. Contains 2 air furnaces, 2 open hearth, 10 crucible brass furnaces, cupola charging floor and elevator, cranes, annealing ovens, molding machines, compressor, etc. Fireproof and modern. Will sell for 40 per cent of value, part cash. Address P. O. Box 176, Hammond, Ind.

FOR SALE

An up-to-date nonferrous foundry located in Northern Indiana. Owner desires to sell on account of health. If you are employed in a foundry of this description and desire to get into business, this is a golden opportunity. A very good proposition for an office man and a foreman to combine their interests. Will sell as a whole or retain part interest with responsible party, or, will lease for a term of years. Please advise what kind of a proposition you would be interested in and we will give you full particulars. All correspondence confidential. Address Box 440, THE FOUNDRY, Cleveland.

Miscellaneous

PROPOSAL

WARE RIVER INTAKE WORKS
Commonwealth of Massachusetts,
Metropolitan District Water Supply Commission.

Sealed proposals will be received at the office of the Metropolitan District Water Supply Commission, 24 School Street, Boston, Massachusetts, until 2:00 P. M., Friday, Jan. 4, 1929, for furnishing about 278 tons of iron castings consisting of 300 shaft lining plates about 1,620 pounds each and 8 castings for valve settings 5,950 to 11,700 pounds each for the Ware River Intake Works of the Wachusett-Coldbrook Tunnel in the Town of Barre, Massachusetts, delivery June to December, 1929. Each bid must be accompanied by a certified check for $500.00. A bond or other approved security in such amount not to exceed 40 per cent of the amount of the contract as the Commission may determine after the bids are opened will be required. Plans, information, forms of proposal, contract and specifications may be obtained from Frank E. Winsor, Chief Engineer of the Commission. The Commission reserves the right to reject any or all bids or to accept the proposal or proposals deemed best for the Commonwealth. R. NELSON MOLT, Secretary.

FOR RENT CHEAP

Foundry 65 ft. wide, 156 ft. long, brick and steel truss construction, has cupola 10 to 12 tons capacity, two pouring cranes, two job cranes, core room 17½ ft. by 44 ft. with all necessary equipment. Owner will furnish light, heat and power, if desired. Will agree to buy at least two tons castings per day at market prices.

FREEMAN MANUFACTURING CO.,
RACINE, WIS.

Wanted

WANTED

1½ or 2 ton electric melting furnace with or without transformers. Give details and lowest price. Address Box 429, THE FOUNDRY, Cleveland.

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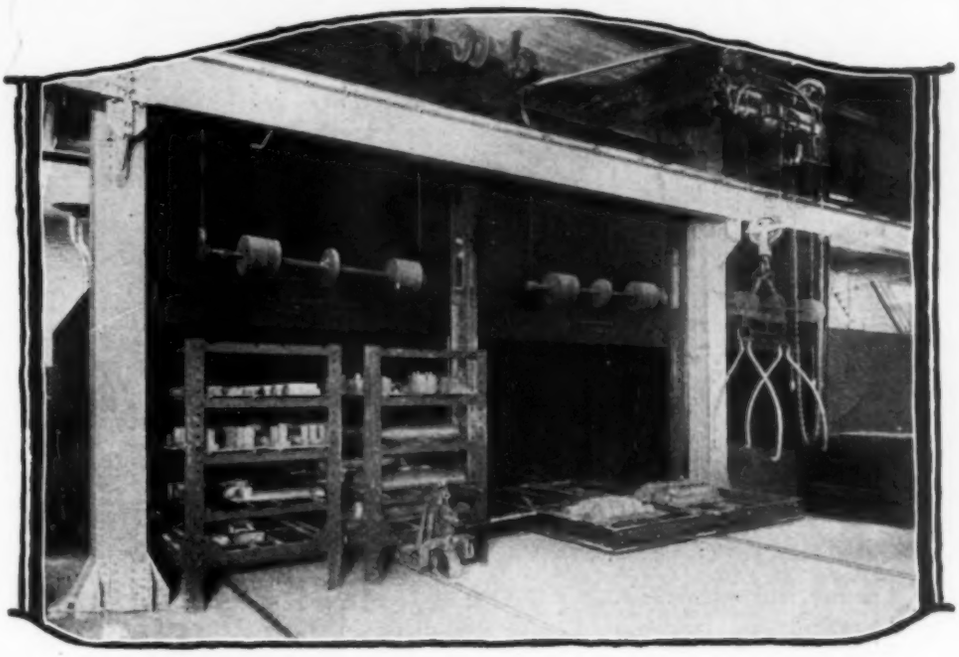

Baking Time Cut 25%
Fuel Consumption Cut 30%

The car and lift rack type ovens shown above were installed by a large machinery manufacturer in the East, as part of his campaign to reduce foundry costs.

After continuous operation for a period of 4 years, a careful check up revealed the fact that baking time had been reduced 25%, fuel consumption had been reduced 30%, there had been no time lost, and not a cent required for upkeep or maintenance.

With the mass of evidence now on file, it is safe to say that any foundry may expect to realize important savings when scientifically built baking equipment is installed.

YOUNG BROS. COMPANY

6508 Mack Avenue, Detroit, Michigan

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YOUNG BROS. CO. OVENS — OUR BOLTLESS JOINT — DETROIT

–OVENS FOR–

Core and mold baking
Low temperature heat treating
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Adapted to all methods of heating

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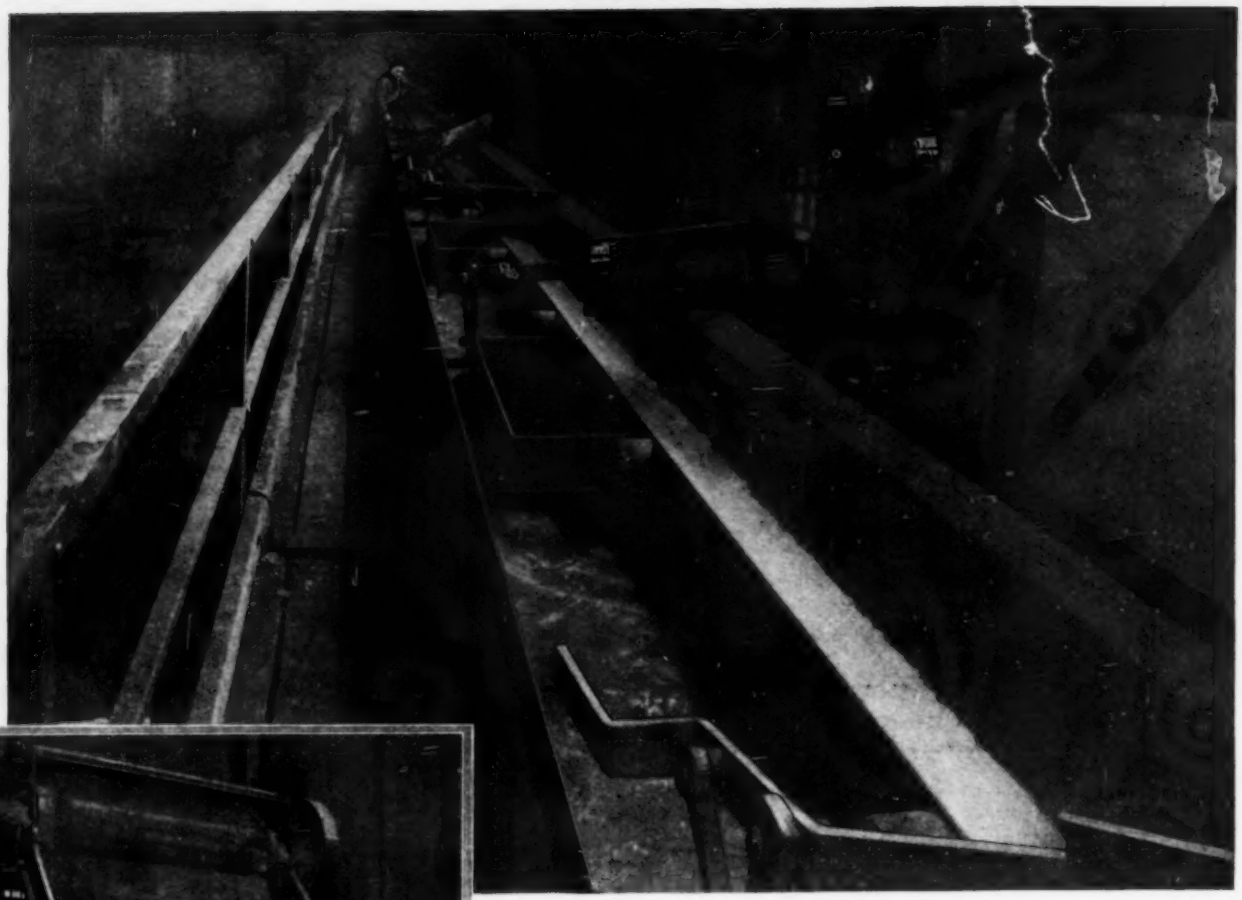

Meeting changing conditions in an old foundry

(American Manganese Steel Co., B ide, Chicago)

HERE is a good example of Link-Belt mechanical handling equipment being adopted in an old foundry to meet new and changing conditions and methods.

Production in this plant consists of a wide variety of miscellaneous castings—largely floor molding work.

Link-Belt equipment—providing a very flexible system—consists of a large shake-out hopper serving as storage, a magnetic separator belt, elevator, vibrating screen, tempering belt, paddle mixer, revivifier, transfer belt, distributing belt, and prepared sand hoppers.

A short time after this unit was put in operation, this concern purchased complete Link-Belt sand preparation systems for two other plants.

To know more about Link-Belt methods ask our nearest engineer to discuss the possibilities your foundry affords. Catalogs upon request.

LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying, and Power Transmission Machinery and Chains

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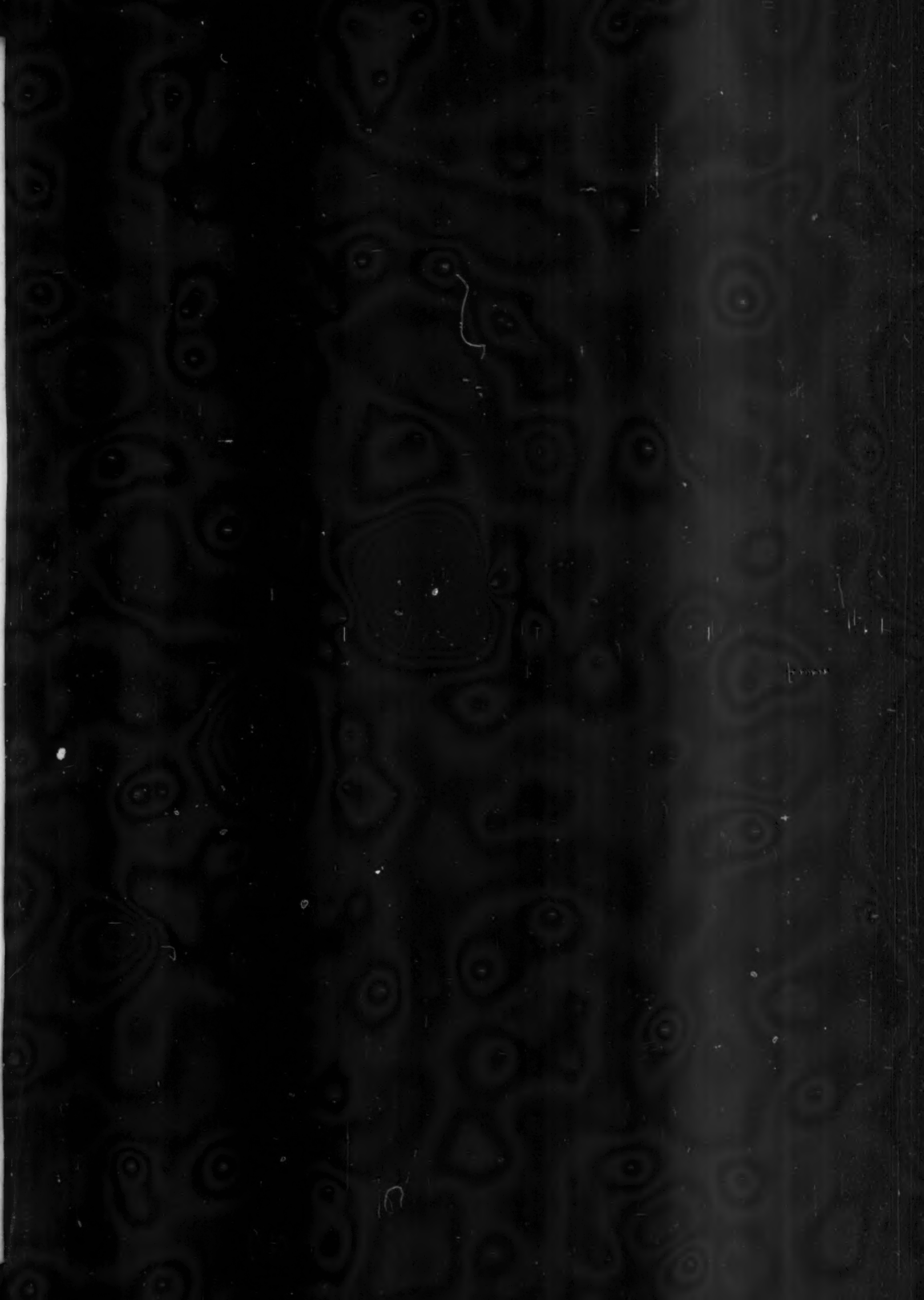
Sand Preparation, Mold Handling Equipment